Infectious Diseases.
PART II.

By Prof. Karl Liebermeister.
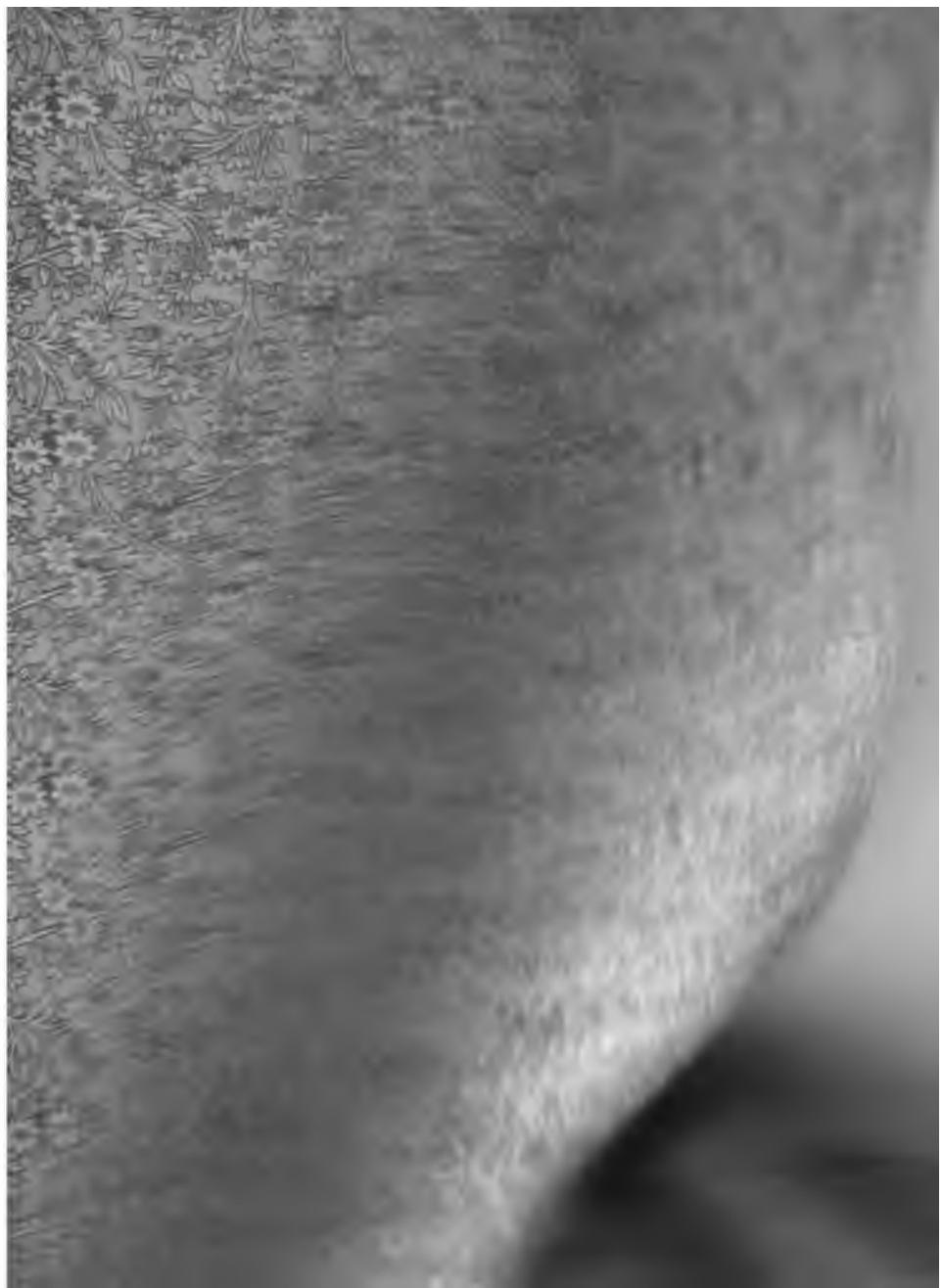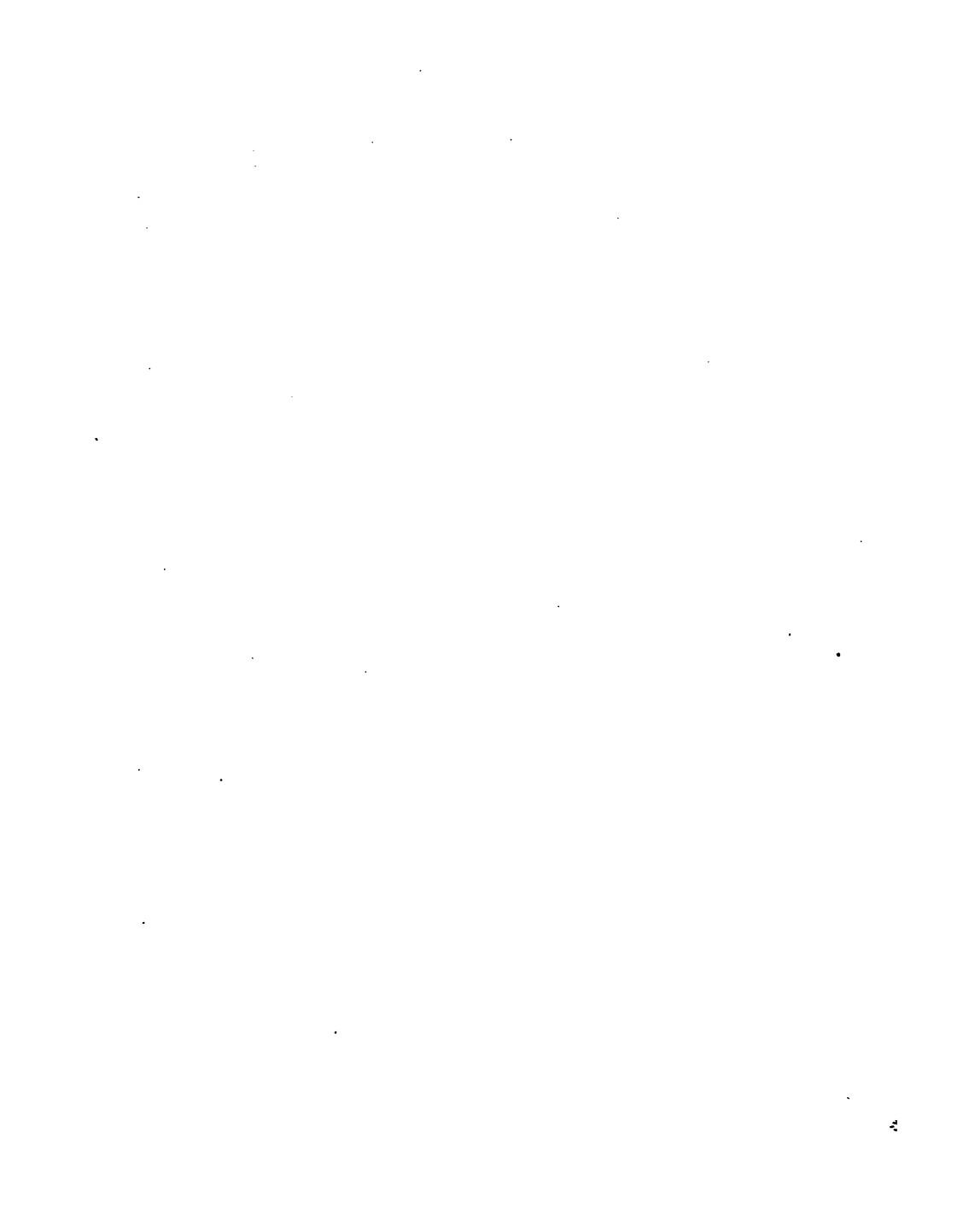
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INFECTIOUS DISEASES.

PART 2.

Measles, Scarlet Fever, Small-pox, Vaccinia, Varicella, Rubella, Diphtheria.
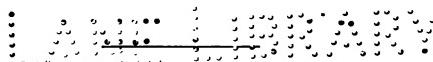
—BY—

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PREFACE.

During the three years that have now elapsed since the work of Liebermeister, whose treatises must be regarded as models of concise and clear statement, was first given to the public, comparatively little of any value has been discovered in the various departments of internal pathology herein treated. The translator has endeavored to indicate in the form of notes and appendices any advances made since Liebermeister wrote. As the publisher of this series has for one of his main objects to present to the busy practitioners of this country convenient and useful hand books of treatment, it was deemed best in the preparation of these two volumes to make therapeutics the principal end; this explains many of the addenda for which the translator is responsible.

NEWBURYPORT, MASS., May 1st, 1888.

CHAPTER III.

CONTAGIOUS DISEASES.

This group is composed of all the infectious diseases which are capable of being directly transmitted from person to person.

The communication is sometimes effected by simple contact (*contactus*, *contagio*). The infectious agent penetrates the organism by a wound, by an accidental solution of continuity of the epidermis; always, in all these affections the inoculation of liquids containing the virus of the disease may occasion the infection. Certain of these diseases are characterized by the fact that the infection may also be propagated by the medium of the air holding in suspension the specific germ (*Contagium volatile*), or by objects or individuals to which the germ may be accidentally attached.

A cardinal point in the history of these diseases, and which even may be said to constitute the essential difference between the contagious and the miasmatic-contagious maladies, is the fact that the infectious agent—the specific germ—on leaving the diseased organism is in a fit state to determine the disease in another individual. Certain of these pathogenic agents, although directly transmissible, seem, it is true, to need to pass through a phase of incubation before giving rise to morbid symptoms, but this incu-

bation is not effected, as in the miasmatic-contagious
diseases, outside the body, but it takes place in the
infected organism itself, and during the so-called
period of incubation.

A — Acute Exanthemata.

In the first order of contagious affections, we
must place the acute exanthematous diseases. The
anatomical lesion which is the most important, or at
least, the most apparent in these exanthems, is a
cutaneous eruption which in each of these diseases
presents well marked characters of its own. But this
eruption constitutes only a part of the symptoms of
the disease; before it makes its appearance, there are
other morbid manifestations, and fever in particular.
The acute exanthemata are not, then, affections of the
skin, and it is at the most only by laying stress on the
outward appearance that they can be classed among
these affections. They are chiefly and pre-eminently
general infectious diseases.

The acute exanthemata are: *measles, scarlatina,
rubella, miliary fever, typhus cxanthematicus, small-pox,
vaccinia and varicella;* the last three diseases are
specifically different, but may be placed in the
same family under the name of variolous exanthems,
by reason of certain resemblances which their symp-
toms present.

The anatomical lesions in the acute exanthemata,
are, in great part, more or less directly dependent on

the specific poison. These lesions, among which we must first place the exanthem itself, then divers other localizations of the general disease, differ according to the affection, and, therefore, must be studied in connection with each separate disease.

There are other morbid changes, however, which have nothing specific about them, and are common to all these affections. The differences which may be noted are no less dependent on the nature of the disease than on the amount and intensity of the virus under which the organism is laboring. It is, then, possible to give a general description of them applicable to all.

Among these non-specific lesions which are met with as well in the acute exanthemata as in other acute infectious diseases, we must mention, first of all, parenchymatous degeneration of the organs, a degeneration which is the more pronounced the higher the temperature of the body has been during the disease, and the longer this hyperthermia has lasted. This degeneration, however, is but little marked, and may even be wanting in all cases where the fever has been moderate or of but short duration, as has been observed in cases where the patient has succumbed to some early complication (such as hemorrhagic small-pox), and before the fever has attained its height.

The hepatic degeneration is distinguished by the uniform color which sections of the parenchyma present to the naked eye; the outlines of the lobules are

indistinct and soon become effaced. The tissue appears
exsanguinous, and is of a color varying from reddish
gray to orange yellow; it is soft and very friable, while
in places preserving a sort of pasty consistence.

The hepatic cells are full of granulations, which
in some of them have even taken the place of the
nucleus. When the degeneration is far advanced the
enveloping membrane has disappeared, and in the
place of the cell nothing but a mass of granular
detritus is found. In an alcoholic patient who died
of small-pox after an intense and prolonged suppura-
tive fever, the temperature being much of the time
41–3° C. (106°–107° F.), I found the hepatic cells
completely destroyed, and replaced by a mass of fat
granules.

In the kidneys the epithelium of the cortical sub-
stance takes on a cloudy appearance, and at a more
advanced period undergoes fatty retrogression.

In the striated muscles it is not rare to observe
that form of degeneration described by Zenker in
1864, in connection with typhoid fever; granular de-
generation on the one part and waxy on the other, the
latter being only a form of necrosis by coagulation.

When death is the consequence of excessive
pyrexia of long duration, certain muscles will be found
so completely invaded by this degeneration that they
will have lost throughout a part of their extent their
normal red hue. The heart has lost its consistence, is
very soft, of great friability, and tears with extreme

facility. The myocardium is more pale than in the normal state, of a grayish yellow, sometimes even of a brownish color. In the primitive fasciculi there is observed a granular cloudiness through which the transverse striae can no longer be distinguished, and sometimes little is seen but a mass of fat granules and of brown pigment.

The vessels are also affected with similar degenerative lesions, especially the arterioles, the greater part of which show traces of fatty retrogression.

The salivary glands, the pancreas and other glandular organs present the same degenerative alterations, and traces of like lesions are found in the nerve centres. The spleen is generally heavier than natural by reason of hyperæmia and hyperplasia of its parenchyma, and its consistence is diminished. How much of this morbid change is due to the hyperthermia, and how much to the direct action of the infectious agent on the spleen? This cannot with certainty be decided. (*Consult Liebermeister: Handbuch der Pathologie und Therapie des Fiebers, Leipsig,* 1875.)

To this order of lesions belong also the alterations determined by the complications and sequelæ observed in each of these affections.

CHAPTER IV.

MEASLES.

Rubeola (Rubeola, Morbilli, Flecken, Rougeole)
is a contagious general disease characterized by a
fever with typical course, an eruption of red spots,
and a catarrhal inflammation of the respiratory pas-
sages and conjunctivæ.

Extensive epidemics of measles prevailed during the
Middle Ages throughout Europe and Asia. This disease was,
however, long confounded with scarlet fever, and even with
small-pox, and the divers eruptive fevers were considered as
only simple varieties of one and the same disease. It was not
till the latter part of the eighteenth century that the individual-
ity of measles was definitely recognized.

All attempts to isolate and cultivate the specific agent of
measles have thus far failed.*

Etiology.

Measles never arises *de novo* (by spontaneous de-
velopment), and when it appears in a given case, it is
always as a result of previous contamination with an
infected individual. The disease is transmissible by
the inoculation of blood taken from the region of the
maculæ, also of the lachrymal and nasal secretions.

[* Thus Salisbury (1862), Hellier somewhat later, Klebs, Coze and
Feltz, Cornil and Babes have reported the constant concomitance of cer-
ain bacteria with the secretions of measles, but have not proved a causal
onnection.—Trans.]

This was proved by some striking experiments per-
formed by Home, in 1758: these experiments have since
then been frequently repeated, with this singular cir-
cumstance, however, attending them, that the outbreak
of measles thereby determined was always of a benign
character. Generally the infection is derived by direct
association with a diseased person, or by the inter-
mediation of objects or of persons that have been con-
taminated by immediate contact. The air may also
be the vehicle of contagion, but within a very re-
stricted area. It is during the periods of invasion and
eruption that the contagion has its highest degree of
activity.

The gravity of the disease varies with epidemics.
Thus very benign epidemics have been observed,
while others have been distinguished by their severity.

Climate and local conditions seem to have no
influence on the development of epidemics which are,
however, more prevalent in cold weather than in warm.

In most countries, epidemics generally reappear
at more or less remote intervals, without there being,
however, any regular periodicity in their return. It is
probable that these epidemic outbreaks are dependent
chiefly on this fact that at the end of a certain time
new generations come upon the stage susceptible to
the disease, and presenting in their organisms a favor-
able culture soil for the germs of the disease.

Instances are on record where the disease has
been pandemic, spreading to all parts of the habit-

able globe, and respecting only countries having
little or no communication with the rest of the world.
Thus measles appeared in the Maderia islands for the
first time in 1808. In Iceland there was for eighteen
centuries no epidemic of measles. In the Australian
continent the disease made its first appearance in 1854.

A first attack confers almost absolute immunity;
it is, in fact, very rare that an individual has an attack
of measles twice in a lifetime. Exception being made
of new born infants, who are but little susceptible to
measles, age seems to have no manifest influence in
the spread of this disease. If it be less often witness-
ed in adult life, this is due to the fact that most per-
sons have had measles during their childhood. He
who has not had measles in youth is hardly likely to
escape it at a later period. In the Feroe Islands, al-
most everybody, without distinction of age, was at-
tacked in 1846, those only being spared who had
passed the age of 65, and who had already had the
disease during the epidemic of 1781.

All races of mankind seem equally liable to con-
tract measles. Epidemics often break out in the
midst of semi-savage people, and generally with
special malignity. Thus when measles was imported
from Sidney to the Fiji Islands in 1784, about twenty
thousand people—a little more than a fifth of the
population—succumbed to the disease. Similar facts
have been observed among the indigenous tribes of
North and South America.

The duration of the incubation, from the moment of exposure to the appearance of the fever of invasion, is about ten days, and till the appearance of the rash, from thirteen to fourteen days.

Symptomatology.

We distinguish three periods in the evolution of measles.

1. *Period of invasion.*—This period begins by a rapid elevation of the temperature, which from the very first evening of the attack frequently attains 40° C. (104° F.) and may vary above or below this figure according to the severity of the case. The next day, more rarely the third day, the temperature falls; the morning remission is in particular very pronounced. The fever, however, generally continues, though in a light form, till the appearance of the rash, when there is a new rise of the temperature.

This fever is accompanied with the usual symptoms; at the onset a more or less violent chill, followed by a sensation of burning heat, great frequency of the pulse, thirst, loss of appetite, general malaise, sometimes more or less somnolence alternating with restlessness and even sub-delirium exceptionally, convulsions. All these symptoms undergo abatement the second day with the fall of the temperature, and in mild cases it can hardly be said that during the entire period of invasion the disease seriously disturbs or interrupts the general functions.

Coincidently with the first appearance of the fever come the symptoms of the specific catarrh; these become more and more pronounced throughout this period of the disease. The mucous membrane of the nose, the conjunctivæ, the velum pendulum, the pharyngeal, tracheal, bronchial mucosa are swollen and present a bright red aspect, which is heightened here and there by patches of a deeper hue, resembling the eruption on the skin. This condition is accompanied by sneezing, lachrymation, photophobia, and generally a dry hard cough with hoarse voice. In some cases, also, a swelling of the tonsils is noticed.

2. *Period of eruption.*—It is a quite common thing during the period of invasion to see little red spots or salient blotches, particularly on the face, but the true eruption does not appear till the fourth day after the onset of the fever, rarely later.

The rash begins ordinarily on the face, then invades the neck and thence spreads over the rest of the body. It is constituted by little maculæ or blotches, first of a pale red, and later of a deep red or purplish color. These spots are well defined, of roundish or irregular, often crescentic outlines. At the onset, they disappear under the pressure of the finger; where the eruption is "confluent" they run together and are lost in one diffuse exanthem. Sometimes the eruption does not rise above the skin (morbilli læves); in other cases the patches are somewhat elevated, and present in their centre a small papule

(morbilli papulosi). The skin between the patches has its normal appearance and is only a little œdematous when the patches are very near together.

The rash generally takes two days to obtain its full development, and after several hours—a day at the most—during which the color remains quite vivid (stadium floritionis), it rapidly fades away.

Coincidently with the appearance of the rash, the temperature rises anew, and this ascent continues till the eruption attains its height. As a general rule, the maximum rise of this period exceeds that of the invasion, and it is not rare to see the temperature mount up to 41° C. (105½° F.) At this stage all the symptoms which accompany the fever are at their maximum of intensity.

Defervescence takes place ordinarly at the end of two days, and rapidly, sometimes, indeed, quite suddenly, oftener, however, by descending oscillations all the morbid phenomena subside. The fall of the fever is generally noticed about the sixth day from the beginning of the period of invasion. All the general disturbances attending the fever speedily disappear with it, and the catarrhal symptoms which had till now persisted, and even with increased intensity, now undergo abatement.

3. *Period of desquamation.*—With the fall of the fever, the exanthem becomes pale and appears under the form of yellowish or slightly brownish spots, which do not completely disappear under pressure. About

eight days after the commencement of the eruption (sometimes earlier, sometimes later), there is a furfuraceous desquamation of the epidermis under the form of branny scales, especially well seen on the face, and which lasts from a few days to a week (stadium desquamationis). Unless some complication has set in, the patient is now almost well, and with the exception of a slight cough which lasts for some time, and a great susceptibility to cold, recovery is complete.

Variations in the Course of the Disease.

In some cases the disease is very mild, the fever insignificant, and the other symptoms wanting, or of a very benign character. Thus, the bronchial catarrh is sometimes lacking, or is so slight as to attract little attention; it is the same with the rash, which may be of a fugitive nature, or even altogether absent (morbilli sine eruptione).

On the other hand, certain epidemics are characterized by cases of unusual severity; the temperature may be so high and the pyrexia so continuous that the remissions are insignificant, and all the symptoms of the typhoid state are pronounced (typhoid or putrid measles). At other times the fever is dependent on the existence of certain complications.

The form which presents the greatest gravity is the hemorrhagic, in which, to the symptoms of the disease, are joined those of the hemorrhagic diathesis:

This form is rare, and is observed only in individuals already enfeebled by a previous disease, or by other causes. It is characterized by the appearance of spots of purpura on the skin, extravasations of blood under the skin and mucous membranes and even in the parenchyma of internal organs. As for the slight hemorrhages (petechial extravasations) which are sometimes witnessed about the patches at the period of their full development or resolution, they are not to be regarded as the expression of a hemorrhagic diathesis, and have no more importance from the point of view of prognosis than the bleedings from the nose which sometimes supervene accidentally during the disease.

The rash may also present great irregularities from the point of view of its dissemination over the body, the order in which it makes its appearance, the size of the patches, their duration, etc. Formerly a great importance was attached to these anomalies, as well as to the feeble development of the eruption, and its too rapid disappearance, and it was believed that these irregularities might give rise to metastases. This fear is not well founded; nevertheless, the rapid disappearance of the eruption sometimes presages some grave complication.

COMPLICATIONS AND SEQUELÆ.

Certain of the complications and sequelæ which are observed as the result of measles are but the

consequence of the alterations produced by the poison.

In cases where the sweats have been profuse, the rash is accompanied by an eruption of miliary vesicles (sudamina) some of which may become pustules.

During the period of invasion or later, erythema, herpes labialis, more rarely urticaria and pemphigus have been witnessed.

Capillary bronchitis, a consequence of the extension of the inflammation to the smaller bronchi, is one of the complications the most frequent and the most to be dreaded, for it is often followed by atelectasis and catarrhal pneumonia. In such cases the fever is again lighted up, and continues with a temperature almost always several degrees above the normal. This lobular pneumonia often passes to the chronic state, and even in cases where the exudation does not undergo the caseous degeneration leading to tuberculosis, recovery is very tedious and protracted.

At other times the laryngeal complications dominate the scene, and give rise to a constant hoarse, racking cough. The swelling and ulceration of the mucous membrane provoke aphonia, laryngo-tracheal wheezing, and in young children even determine attacks of suffocation (false croup).

The nasal catarrh, in propagating itself to the mucous membrane of the Eustachian tube and middle-ear, may lead to perforation of the membrana tympani.

The rubeolic conjunctivitis, occurring in scrofulous subjects, may be the starting point of grave affections of the conjunctiva and cornea. The intestinal catarrh, on the other hand, only exceptionally presents any gravity, as when occurring in quite young children.

Rubeola is seldom attended with any tendency to those necrobiotic processes which are so common in the other grave infectious diseases. Nevertheless, in the malignant forms, one will sometimes see diphtheritic patches develop on the mucous membranes, and spots of gangrene on various parts of the skin.

In feeble, cachectic children, noma may be one of the sequelæ of measles.

When the fever is very intense, a little albumen is sometimes found in the urine, but true albuminuria, the acute form of Bright's disease, is very rare, in fact only exceptionally occurs in measles.

Among the complications which are quite accidental, we may mention lobar, croupous pneumonia, pleurisy, endocarditis, pericarditis, diphtheritic sore throat, parotiditis. We may mention also among consecutive affections, chronic adenitis, which may end in abscesses or in caseification, furuncles, phlegmon of the cellular tissue, inflammations of the periosteum and joints, and acute miliary tuberculosis. Lastly, an outbreak of measles has sometimes been witnessed in an individual affected with variola, varicella, typhoid fever, etc.

Prognosis.

The prognosis in simple cases is generally favorable. In the absence of complications, a fatal issue is altogether exceptional.

Any danger attending the disease is dependent principally on the complications, and as these have for their effect to increase and prolong the fever, the prognosis will in general be the more favorable, the more regular and normal the curve of the temperature. The existence of a previous disease on which the measles is grafted notably aggravates the situation. The affection presents greater gravity during the first two years of life, for at this age it is almost always complicated with capillary bronchitis, which is generally fatal.

The mortality varies greatly according to epidemics. In those which are benign, fatal cases are exceptional, and do not amount to more than one or two per cent. In grave epidemics the mortality may attain 10 per cent. A higher proportion than this is only observed among savage tribes, or as the result of absolute neglect and want of treatment.

TREATMENT.

Prophylactic measures of isolation are less applicable to measles than to the other contagious diseases, and as the immense majority of persons must have measles sooner or later, means of prevention have only a secondary importance. It is only in epidemics

characterized by great malignity, that the exercise
of active preventive measures is urgently imposed on
the physician. It is, moreover, incumbent on medical
men and boards of health to protect as far as possible
from contagion all individuals to whom the disease
might be especially dangerous, such as infants and
persons debilitated by sickness or other causes.

Preventive inoculations have not as yet been
sufficiently practised to enable one to form a definite
opinion as to their value.

In the majority of cases the disease demands only
an expectant treatment. The patient should be con-
fined to his room, be put to his bed, and should be re-
stricted to rather low diet, and the usage of cool de-
mulcent drinks. [The vulgar have great faith in saf-
ron tea, which can do no harm.] If the light is pain-
ful, the room should be partially darkened; scrupulous
care should be taken that it be well ventilated. The
fever does not generally demand active treatment,
nevertheless in cases where the temperature is high,
cold ablutions, give great relief, [Teaspoonful doses
of Mindererus, a few drops hourly of sweet spirits of
nitre, satisfy the demand of the patient for medi-
cinal treatment.] When the fever is very intense and
the remissions but little marked, there is an indication
to bring down the pyrexia by the refrigerant method,
as well as by the use of quinine and other antipyretics.
In the case of adults I do not hesitate to employ in
my practice cold baths; in that of young children,

tepid baths or the wet pack suffice in a great majority of cases.

As for the bronchial catarrh, and other complications which may supervene in the course of the disease, very simple treatment is generally all that is demanded and the practitioner should take for his guide the indications of the moment. [The cough often demands some palliative; here a little ipecac with mucilage, tolu and paregoric often serves a good purpose.

> ℞ Vin ipecac, ℥ iiss,
> Mucilage
> Syr. tolu
> Paregoric elix. ää ℥ i.
> M. Sig.—A teaspoonful when required.

The compressed pills of Dover's powder, $2\frac{1}{2}$–5 grs. taken at night are frequently useful. In some cases attended with considerable fever, dry cough, hoarseness and thoracic oppression, Graves' mixture, each dose of which contains $\frac{1}{12}$ gr. of tartar emetic 5 grains nitre, 1 or 2 drops laudanum in a spoonful of camphor water, has an excellent effect.

Hardaway [*] advises that in children the chest should be well smeared with camphorated oil, over which should be worn an oil silk jacket. " The sometimes violent paroxysms of false croup are very satisfactorily managed by gently pressing a sponge soaked in hot water under the chin, and over the front of the

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[*] Pepper's Syst., Am Med., vol. 1, p 581.

neck. When the dyspnœa is alarming, emetics and the general warm bath should be brought into requisition."]

After defervescence and during desquamation, the utmost care is necessary that the patient shall not be exposed to cold, and he should be required to keep his room for some time, and especially during damp and chilly weather.

CHAPTER V.

SCARLET FEVER.

Scarlet fever (scarlatina) is a general contagious disease whose principal characters are FEVER with a typical course, an EXANTHEMATOUS RASH constituted by a diffuse redness of the skin, an ANGINA or sore throat, and very often NEPHRITIS.

Scarlet fever is a disease which is less frequent and less prevalent than measles or small-pox. Common in Europe, it is almost unknown in the greater part of Asia and Africa. It made its first appearance in North America in 1735, in South America in 1729, and in Australia in 1848. *

In no other infectious diseases do the characters so vary according to the epidemics. In some epidemics the affection manifests itself with extraordinary benignity (mild scarlatina), in others it is attended with a death rate which resembles that of cholera or the plague. It is not rare to see grave epidemics succeed mild epidemics in the same locality, and *vice versa.*

The microbe of scarlatina has not yet been discovered, although mycologists have at different times

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* [Sydenham established the specific nature of scarlatina in 1675, differentiating it from measles of which it had heretofore considered a variety. His observations of epidemics occurring in London from 1661 to 1675 are very exhaustive, and subsequent knowledge has confirmed the results which he obtained.—TRANS.]

signalized the presence of micrococci and bacteria in the blood of scarlatinous patients.

Etiology.

The sole cause of the communication of the disease is a specific contagion. Transmission may be effected directly by contact, or at short distances by the medium of the air. The attempts which have been made to communicate the disease by inoculation have sometimes given positive results. *

Clothing and other objects which have been in contact with persons affected with scarlatina, and even individuals that have been near them (notably physicians and nurses), have been bearers of the contagion to healthy individuals.

The contagious element becoming attached to the walls of the patient's bed-room, to his garments or other objects, seems able in certain circumstances, to preserve its activity for entire months. Boiling water with certainty destroys the virus.

Epidemics of scarlatina are less frequent than epidemics of measles. They invade in general a smaller population, less rapidly increase in intensity, have a less acute march, and oftener terminate by

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* A peculiar streptococcus was found by Klein in scarlatinous vesicles, whose inoculation determined in calves an intense congestion of the throat, liver and kidneys, as well as vesicles in the mouth. See Thomas, in Ziemssen, art. "Scarlatina."—TRANS.

sporadic cases which do not seem to have any apparent
relation to each other. The influences of locality,
of climate, and meteorological conditions have but a
secondary rôle in the development of these epidemics.
As for seasons, cases of scarlatina appear to be a
little more numerous in the fall than at other times of
the year.

Individual receptivity for scarlet fever does not
differ much among the various races of mankind.
The susceptibility for scarlatina is, however, les univer-
sal than that for measles, and multitudes escape the
disease even after being exposed to the contagion.

In the first year of life, the predisposition is but
slight. Scarlatina has, however, been observed in
infants in utero.* It is between the ages of two and
six years that the receptivity is at its maximum. Sus-
ceptibility to the disease diminishes with age, so that
the greater part of individuals who have not had
scarlet fever in early life are likely to have immunity
from it the rest of their days. As a general rule, in
adults only the light or abortive forms are witnessed,
and severe or fatal cases are quite exceptional.

In pregnancy, scarlet fever is rare. It is, on the
other hand relatively frequent in the puerperal state,
and offers in these cases a special gravity.

Other acute or chronic diseases are in no sense
antagonistic to scarlet fever, and in nothing diminish
the susceptibility.

*See cases cited by Thomas in Ziemssen.—TRANS.

A first attack of the disease generally confers immunity for the rest of the life. It is only very exceptionally that one observes a relapse during the period of convalescence, or return of the disease after recovery.

The duration of the *incubation* is shorter in scarlatina than in small-pox or in measles. This period lasts on an average one week, but may be shorter, rarely longer than this.

<div align="center">Symptomatology.</div>

The period of invasion is sometimes preceded for several hours, or even days, by symptoms of weariness and depression, an undefined feeling of malaise, headache, anorexia, furred tongue, pricking sensation in the throat, difficulty of swallowing, redness and swelling of the tonsils, uvula and soft palate. In a large proportion of cases, vomiting is the first symptom of the disease.

1. *Period of invasion.*—The fever ordinarily begins by a chill accompanied by a rapid rise of the temperature; in infants this onset is sometimes marked by convulsions. The temperature attains from the very first a high elevation, and in grave cases it is not rare to see it mount up to 41° and even to 42° C. (105° to 107° F.). The frequency of the pulse is in the ratio of the temperature.

The skin is red, hot, and dry; the little patient is restless and uneasy; complains of headache; some-

times manifests delirium or stupor; vomiting is frequent; the lips are dry; the tongue is thickly coated, or already presents a remarkable redness; deglutition becomes more and more difficult. The velum pendulum and tonsils are considerably swollen, and in very young children this swelling may cause great embarrasment of the respiration.

About the end of the first day, dating from the onset of the fever of invasion, or during the course of the second, the eruption begins to make its appearance.

2. *Period of eruption.*—The exanthem appears first on the face, neck and chest, and spreads thence to other parts of the body. It begins by little red points very near together, which increase in size, become confluent, and end in forming that diffuse redness, accompanied by slight swelling of the skin, which is so characteristic.

The intensity of the coloring is very variable; little marked in some cases, in others the rash takes on a dark red hue. Certain regions are of a lively red, others of a paler color, others still, and notably the parts around the mouth, the extremities and certain parts of the trunk, preserve their normal color.

The redness is naturally deeper in parts which are habitually covered, and at the period of the exacerbations of the fever. At first it is easily effaced under pressure, and on applying the hand with some

force over the skin where the rash is well out, the eruption is seen to pale perceptibly. Later the red hue fades considerably, but there remains where the exanthem was deepest an indelible yellowish stain.

The tongue is scarlet, purple, or even violet, with swollen, erect papillæ. At the onset it is covered with a whitish fur, through which the fiery red hue is readily seen, but at a more advanced period this coat disappears, and brings prominently to view this peculiar aspect of the lingual mucosa. The mucous membrane of the mouth, throat and lips is also deep red. The swelling of the tonsils continues to increase, as well as the difficulty of deglutution.

As long as the rash is in full bloom the fever continues, and the temperature remains at about the same height. In certain cases, however, before the eruption has attained its maximum development there is a remission. There is, nevertheless, in all cases a slight morning fall, corresponding to the normal daily oscillations.

The fever is accompanied with the ordinary symptoms: great agitation, nocturnal delirium, somnolence during the day, and in some cases there is a pronounced typhoid state.

The urine is scanty and high colored, and sometimes contains albumen and traces of blood.

3. *Period of Desquamation.*—The exanthema with its typical characters lasts but a few days, sometimes only one day. It soon begins to fade away,

and in the course of four or five days after its first ap-
pearance it has completely disappeared. It is the
same with the redness of the tongue and the mucous
membrane of the mouth and throat, as well as the
swelling of the tonsils. Coincidently with the dis-
appearance of the eruption, the fever presents marked
remissions. The evening temperature falls little by
little; at the end of several days, if there be no com-
plications, the temperature returns to the normal.

The duration of the scarlatinous fever varies
much, being very short in mild cases, and exceeding
six days or even more in grave cases.

The desquamation of the epidermis begins some-
times immediately after the disappearance of the erup-
tion, sometimes several days later, at other times it
does not take place till after several weeks. In cer-
tain cases, and in particular regions of the body, this
process is characterized by the separation of little fur-
furaceous scales, but generally it is under the form of
large epidermic flakes, several centimetres in diameter,
that the desquamation is effected. Thus, for example,
the epidermis of the fingers and toes generally peels
off in great shreds like the finger of a glove, and in
regions where the skin is very thick, as the palmar
aspect of the hands and the soles of the feet, it falls
in great flakes.

The duration of the desquamation period is very
variable. Sometimes the process is completed in a
few days, at others in a few weeks, and as long as this

stage is in progress, the skin presents an extreme impressibility to variations of temperature.

It is during this period that the first symptoms of renal disease generally declare themselves, or other complications which so often set in to retard convalescence.

Variations in the Course of the Disease.

The irregularities which the disease presents in its evolution may depend on its degree of malignity. There are cases where the evolution is incomplete (abortive scarlatina); others in which the fever and the other symptoms are but little pronounced, and whose course is quite mild; others again in which one or several of the characteristic symptoms are lacking. Thus the exanthem may be wanting, or be so trifling and so fugitive as to pass unperceived (*scarlatina without eruption*). In some cases, which in other respects undergo a normal evolution, the fever is from the first and sometimes during the entire duration of the dis-·ease very light (*sub-febrile scarlatina*).

The albuminuria and other renal symptoms are far from being constant. On the other hand, the throat lesions are almost never wanting, even in the abortive cases or in cases without eruption, where they sometimes take on the form of malignant diphtheritis.

At other times the disease presents itself with characters of great malignity; the fever, in particular,

is very violent and of long duration; it is in these cases that we often witness the *typhoid state* with grave cerebral symptoms. The enfeeblement of the heart then gives to the fever an asthenic character, and death may ensue by paralysis of the myocardium or of the nerve centres in the period of invasion before the eruption makes its appearance.

In certain rare cases, a hemorrhagic diathesis complicates the disease, and the medical attendant finds himself in presence of that form which is called *hemorrhagic*, with petechiæ, sanguineous extravasations under the skin, hemorrhages of the mucous membranes and internal organs. This form is almost always fatal.

The eruption itself presents numerous variations. Sometimes it remains limited to certain regions and spares others. At other times it is the order according to which different parts of the body are invaded which is modified. In some cases, instead of a diffuse redness, the clinical attendant will observe circumscribed spots resembling those of roseola with large maculæ (*scarlatina maculosa*). In other instances, along with a diffuse redness with brighter infiltrated spots, observed from the first, there are seen in the centre of these spots, little papules, which are quite perceptible to the touch (*scarlatina papulosa*). Very frequently, and chiefly in regions of the body habitually covered and kept warm, an eruption of miliary vescicles make its appearance (*scarlatina miliaris*), which

in some rare cases contain a little pus (*scarlatina pustulosa*), or form large bullæ (*scarlatina pemphigoidea*).

It is not rare to behold, even in normal cases, little subcutaneous sanguinous extravasations which have no importance from the point of view of prognosis.

Complications and Sequelæ.

Scarlatina is one of the diseases in which complications and sequelæ are of the greatest frequency, and present the most gravity.

These complications pertain, in part, to the usual local fluxions, of which they are generally but an exaggeration, or at least one of the consequences. Scarlatinous sore throat often undergoes transformation into the so-called diphtheritic angina. The isthmus of the fauces, which is much swollen and very red, is covered with a false membrane of a grayish-white color, which is, however, nothing but a superficial eschar.

Sometimes this necrosis extends in depth, and destroys a large part of the tonsils. Sometimes it spreads superficially; the pseudo-membranous patches invade the rest of the throat and the mouth, and by the posterior fauces are propagated to the nasal fossæ.

In cases where the termination is favorable, the eschar finally becomes limited, separates, and leaves in its place a cicatrix. It is in the malignant forms that we are more likely to observe these extensive

sloughs, which have given to this form of angina the name of *gangrenous angina*.

Some authorities class scarlatinous diphtheria along with diphtheria proper, and regard it as only a simple complication, the one disease being grafted upon the other. This complication may assuredly arise in localities where scarlatina and diphtheria prevail simultaneously as epidemics. But such an hypothesis is inadmissible in the majority of cases, pseudo-membranous-scarlatinous angina being generally observed in times and places where no true diphtheria exists. For my part, I am persuaded, with Henoch, that this angina is nothing but a necrosis of a non-specific nature, resulting from the intensity of the inflammation.

Abscess of the tonsils and neighboring parts is much more rarely observed than diphtheritic necrosis.

Scarlatinous angina is very generally accompanied with engorgement of the cervical glands, and sometimes even of the neighboring cellular tissue. The parotid and sub-maxillary glands may also participate in this inflammation, which generally terminates by resolution, though rarely by suppuration. In the specially malignant forms one sometimes observes the termination by gangrene.

By reason of propagation of the inflammation to the Eustachian tube, it is not rare to see affections of the auditory apparatus ensue. Otitis media, which declares itself ordinarily by recrudescence of the fever and by violent pains in the ear, has for its usual consequence perforation of the membrana tympani.

As soon as this perforation takes place, the fever falls, and all the other symptoms subside. Permanent deafness and caries of the petrous bone are rare.

Nephritis may be considered as one of the most frequent complications of scarlet fever, it may almost be said to be constant. Sometimes the urine contains but a very little albumen, with a few blood globules and casts, and in these cases the affection yields rapidly; at other times the medical attendant sees before him acute Bright's disease with all its attendant dangers.

This disease is one of the most frequent and most formidable sequelæ of scarlatina; it is observed both in the light forms and in the grave forms, and appears ordinarily during the period of desquamation or even later, sometimes as the result of a chilling from exposure to cold, but very often without any known occasioning cause. The urine is scanty, contains large quantities of albumen, sometimes blood, hyaline casts and epithelial debris from the tubules. Micturition is sometimes accompanied by pains in the region of the kidneys, and a little strangury. The fever is rekindled, and is frequently accompanied by nausea and vomiting. There is now anasarca, which is intermittent in its appearance, and invades successively different regions; there are frequently effusions into the serous cavities, especially the peritoneal, and œdematous infiltration of the internal organs. When the urinary secretion is insufficient, and there exists at

the same time œdema of the kidneys, uræmia is almost
sure to make its appearance, manifesting itself in mild
cases by headache and vomiting, and in grave cases
by epileptiform convulsions and coma (*uræmic
eclampsia*).

In other cases the symptoms of cerebral œdema
predominate; these are distinguished from true uræmia
by the character of the cerebral phenomena. In cere-
bral œdema these symptoms (which have a relatively
slow evolution) consist at the onset in simple stupor
and lethargy, which only gradually runs into coma,
and is not accompanied by convulsions.

In other cases the symptoms of œdema of the
lungs or of the glottis predominate. All these morbid
accidents are dependent on the renal affection, and
are often the cause of death at this period. At other
times it is with a general dropsy that the physician has
to deal.

When the patient passes through the acute period
safely, recovery is the rule. In fact the passage of
scarlatinous nephritis to the chronic stage of Bright's
disease, which according to some authorities is very
frequent, is in my experience very rare and quite ex-
ceptional. The disease may, it is true, be long pro-
tracted. It is not uncommon to find albumen and
blood in the urine several months after recovery from
scarlet fever. But these troubles eventually disap-
pear altogether, and without leaving any trace behind.

I have had occasion to observe a great many

cases of chronic parenchymatous nephritis, always terminating by death after a duration of several years, and I do not know of a single case that could, with certainty, be referred to a previous attack of scarlet fever.

Under the name of *scarlatinous articular rheumatism*, an affection of the joints has been described which manifests itself at the outset of the period of desquamation, and which ordinarily invades, one after the other, several joints, particularly those of the extremities. The symptoms are those of acute articular rheumatism; nevertheless its duration is generally shorter than ordinary acute rheumatism. In some very rare cases the joint inflammation may go on to suppuration.

Other complications may be regarded as purely accidental, and as but the consequence of the general disorders of nutrition, and particularly of the parenchymatous degeneration of the tissues determined by the hyperthermia. I may mention in particular as complications of this sort: the furuncles and suppurative gland-inflammations which have been noticed as sequels of scarlatina, the abscesses of the cellular tissue, the periostitis or caries of the bones, the catarrh of the stomach and intestines, the lobar and lobular pneumonia (the latter sometimes passing to the chronic state and leading to tuberculosis), the pleurisy, pericarditis, endocarditis, peritonitis, meningitis and certain affections of the nervous system, which sometimes follow. Lastly, it must be borne in mind, that an at-

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tack of scarlatina may coincide in the same individual
with the presence of other diseases, such as diphtheri-
tic angina, small-pox, varicella, measles, abdominal
typhus, etc.

Prognosis.

Scarlatina is generally a much graver disease
than measles. The mortality in mild epidemics is, it
is true, quite insignificant, but these mild epidemics
are, at least at the present day, relatively rare, and in
the grave epidemics the mortality may attain 30 to 40
per cent.

The prognosis may be considered as favorable in
cases where the fever is not excessive, where the dis-
ease runs its course normally, and where there exist
no grave complications; it should not be forgotten,
however, that certain of these complications only show
themselves at a late period, and that the most benign
forms are by no means always exempt from them.

In adults, scarlatina is generally less grave than
in children. The existence of a previous disease,
pregnancy, and the puerperal state, notably aggravate
the prognosis.

Death may ensue at all periods of the disease. In
the malignant forms, the fatal termination sometimes
takes place in the period of invasion, and must be at-
tributed in these cases either to the overwhelming

toxic effect of the infectious principle, or to the high elevation of the temperature.*

Death coming on at a later period is sometimes the result of prolonged hyperthermia, sometimes of some complication, such as gangrenous angina, nephritis, etc. Nevertheless, even in cases where uræmic symptoms and cerebral œdema have already appeared, the physician should not despair of a cure.

Treatment.

The most certain means of preservation against scarlet fever is isolation, and as not everybody is attacked during an epidemic, but only those who have been exposed to contagion, there is a formal indication to separate healthy children from those who are victims of the disease.

During epidemics presenting a character of malignity, schools ought to be closed. Physicians in attendance on scarlet fever patients ought to have care to change their clothes before visiting other patients, especially such as are children. The patient's clothing and other effects which have been in contact with him ought to be disinfected. The room which has been occupied by a patient ought after-

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* Fulminant scarlatina, where the heart and brain are, as it were, overwhelmed by the violence of the poison. Henoch, in this connection, supposes a paralyzing action on the pneumogastric and solar plexus.—TRANS.

wards to be thoroughly fumigated with burning sul-
phur, the doors and windows being shut.

[As regards prophylaxis, Dr. Jamieson (Lancet,
July 30, 1887) calls attention to the value of
inunctions of vaseline or some other fatty substance
all throughout this disease.* A very important point
is the frequent washing of the scalp with some disin-
fectant lotion, as the branny scales from this region
are especially dangerous as a source of infection. As
to the disinfection of clothing, bedding, etc., this may
conveniently be accomplished by placing all such
articles as have been infected in a wash-tub containing
three gallons of water, eight ounces of zinc sulphate,
and one ounce of carbolic acid. They should be
soaked in this fluid at least an hour, and then placed
in boiling water for washing. No handkerchiefs
should be used about the patient, but only soft rags,
which should afterwards be burned. Water-closets
should be daily disinfected with the above fluid.]

The treatment of the disease should be expectant
and symptomatic. There is no specific agent yet
known which, when taken into economy, has 'the
power of neutralizing the infectious principle when
it has once entered the blood. The patient should
keep his bed, be put on a low diet of milk, gruels, and

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*The supposed prophylactic power of belladonna has
been shown not to exist, and that of boric acid is doubtful.—
TRANS.

diluents, and the temperature of the room should be kept rather cool. If the bowels are constipated, a movement should be solicited by cold lavements or mild salines. The fever furnishes the principal indications for active treatment. As long as the temperature does not exceed 40° C. (103° F.), no particular antipyretic medication is demanded. It is only in cases where the remissions are not sufficiently marked, that it is necessary to interfere by means of occasional cold baths, or the wet pack applied in the night time. Sponging the body with cold water, moreover, is useful during the continuance of the fever, and is agreeable to the patient.

When the temperature is high, whether in the period of invasion or later, mounting up to 41° or 42° C. (105°–108° F.), the situation is a grave one and the danger is imminent. Here the best antipyretic agents which the physician possesses should be brought into requisition to combat the perilous hyperthermia. It is in these cases that cold baths repeated every hour till the temperature is brought down below the dangerous point render the greatest service. If the baths do not suffice, quinine in large doses may be given: 20 to 45 grs., to adults, 15 grs. to children from 3 to 6 years of age. Antipyrine may also be given in these cases. The cold baths should be repeated whenever the temperature threatens to rise to an alarming height.

[Some authorities counsel the employment of

warm baths throughout the entire duration of the
fever. The cold wet pack is an efficient means of re-
ducing the temperature. The child should be
wrapped in a sheet wrung out of water at 70° F., this
is covered by one or two blankets. In half an hour
the little patient is returned to the bed. (Dr. J. Lewis ·
Smith in Pepper's system of Medicine. This writer
prefers as an antipyretic the application of an india
rubber ice bag to the head).]

At the close of the last centuary, James Currie and his
followers claimed excellent results from cold affusions in scar-
latina. As for the apprehension of danger resulting from the
retrocession of the rash by the usage of cold water, or from
the renal fluxions which might ensue from the cold baths, ex-
perience has shown that all these fears are without foundation.
Careful observations of the facts has shown that in the grave
forms of scarlatina, the physician's intervention is efficacious
just in proportion to the promptness and energy with which he
carries out the antipyretic treatment.

If there exist any symptoms of paralysis of
the heart, the physician should administer stimulants
such as wine or whisky, with which he may associate
(as occasion may demand) musk and camphor, or
ammonium carbonate.

For the scarlatinous diphtheria I cannot too
much recommend the free use of powdered sulphur,
which should be dabbed or blown upon the mucous
membrane; this facilitates notably the detachment of
the mortified tissues. Moreover, for chiidren of a
certain age and for adults, disinfectant gargles should
be prescribed (a 10 per cent. solution of salicylate of

soda or boro-glyceride, diluted with as much water; the latter preparation may be painted full strength on the throat.)

In scarlatinal nephritis when the scantiness of the urine gives warnings of uræmia, the most urgent indication is to provoke either speedy diaphoresis [by pilocarpine ($\frac{1}{8}$ gr. every four hours)] or rapid diuresis. The latter result may be obtained simply by the ingestion of an abundance of liquid. I make my patients drink freely of milk and water, according to the directions of Immerman.

Diuretics of which the basis is digitalis may be prescribed; one drachm of infusion of digitalis with five grains of acetate of potassium may be given every three hours. The acetate of potash may be given without the digitalis along with some of the vegetable diuretic infusions, as parietaria, broom-top or parsley.

This treatment has ordinarily for a result rapidly to diminish the dropsy; when fever is absent, diaphoretics, such as lequi ammoniæ acetatis, may sometimes be administered to advantage. In some cases it will be necessary to have recourse to paracentesis and evacuation of the effusion by the trocar.

[Salicin is excellent for rheumatic complications, and cotton wool, iodine, and iodide of potassium for checking and causing resolution of the cervical glandular enlargements. The intense itching which sometimes annoys the patient may be relieved by carbolized vaseline ($\mathfrak{Z}$ i carbolic acid, vaseline 4 ounces).

For the otitis, when obstinate, paracentesis of the drum head may be required. For the subsequent otorrhœa, weak carbolized or boracic injections will be useful.]

For the treatment of other complications, the physician will be guided by the symptoms.

CHAPTER VI.

SMALL-POX.

Small-pox (variola) is a general contagious disease, characterized by a fever which pursues a typical course, and by a pustular eruption.

Small-pox was known in India and China before the Christian era. We find it raging in Europe at the end of the middle ages, and in modern times down to the end of the last century it was the most formidable and widely prevalent of epidemics. In our own times, owing to the protection of vaccination, its importance has been very much lessened, and it is now hardly known in the form of a spreading epidemic except among savage tribes.

We designate the normal typical form under the name of *variola*, and the attenuated form under the name of *varioloid*.

Etiology.

Small pox always originates from contagion. The morbid agent whose introduction into a healthy organism is capable of causing the disease, has its special habitat in the pustules of the skin, and attains its maximum of activity immediately before the maturation of the pustules. Later, the infectious properties of the contents of these pustules become less virulent, but continue, nevertheless, after the desiccation of the pocks.

The inoculation of lymph or purulent matter

from the pustules is the most certain means of intro-
ducing the poison into the organism, but infection
may also be accomplished by contact of the skin with
clothing or any object whatever to which is attached
a little of the liquid of the pustules. The contagion
may also be transmitted by the mediation of a third
person. Lastly, it may also be propagated, though
only at short distances, by the medium of the air hold-
ing in suspension particles of the dried crusts.

As this contagium may be transmitted by the air,
it has been regarded as a volatile contagium. It has
not thus far been certainly known whether it be neces-
sary that the virus, in order to produce its effects,
shall be introduced by the mouth or nares into the
alimentary canal or respiratory organs, or whether it
is sufficient that the germ be deposited on the skin.
It seems, however, to be a fact that the disease may
be caused both by the introduction of dried pus into
the nasal cavity, and by the ingestion of the crusts.
But it is still a matter that is not absolutely demon-
strated, whether the deposition of the contagion upon
the healthy skin may be followed by infection, or
whether, as is more probable, a previous solution of
continuity of the epidermis is necessary.

The poison does not seem to be found in its
active form anywhere but in the pustules. At any
rate, inoculations with the blood, with the urine, with
the saliva or dejecta of patients, have not heretofore
given any positive results.

In the immense majority of cases of small-pox, it may be easily determine by careful inquiry that the infection had for its point of departure direct or indirect communication with an individual affected with the disease. But even in cases where it is impossible to arrive at a certain demonstration of this, one is not warranted in admitting a spontaneous generation of the small-pox virus, for many of the modes of transmission of the disease still escape us.

The schizomycetes supposed to be the specific agent of the disease have not yet been discovered. In 1864 I undertook some microscopical researches with the fresh liquid of small-pox pustles.

In employing very high powers (immersion objectives), I found numerous figured elements which were undoubtedly micrococci and bacteria, but in normal pus (from abscesses) forms quite like these are seen which it is impossible morphologically to distinguish from the micro organisms of small-pox pustules. I have never found in the blood any abnormal element. Since this time, numerous observers have determined the existence of micrococci in the deep textures of the skin and in the pustules of patients.

The contagious element of small pox is endowed with extraordinary permanence. When protected from the air, the dried pus from the pustules may preserve its virulence a very long time. The active properties are at length destroyed by exposure to the air, chlorine, sulphurous acid or alcohol; they perish very rapidly when subjected to a high temperature. The corpses of individuals who have succumbed to the disease possess also virulent properties.

Individual receptivity for small-pox is almost universal. In former ages, persons who were exposed to the contagion rarely escaped the disease. In the first year of life the predisposition is less marked than in after years; there are instances, however, where the fœtus in utero has contracted the disease; such cases, however, are very rare.

The existence of another disease, and especially of an acute disease, seems to diminish the receptivity. Small-pox has, however, been known to appear in individuals suffering from chronic affections, and more rarely from acute affections. Pregnancy and the puerperal state nevertheless increase the predisposition.

Among the different human races, the negro seems to have a special aptitude to contract the disease.

A first attack confers an almost complete immunity; the same is the case with vaccine. This immunity, however, is but relative, and in most persons the aptitude of the economy to be impressed by the variolic virus gradually reappears at the end of a cer tain number of years, and this is the case as well after vaccination as after small-pox. It should be added in this connection, that a second attack is generally lighter than the first.

Conditions pertaining to climate, seasons of the year, meteorological influences, the situation of localities, etc., which have so much importance in the propagation of the miasmatic-contagiuos diseases, play

but an insignificant rôle in the spread of small-pox.
In order that an epidemic may be engendered, it is
sufficient that the infectious agent shall encounter a
certain number of individuals endowed with recep-
tivity.

The massing together of a great number of per-
sons having free communication with each other
naturally favors the diffusion of the disease.

The *incubation* has ordinarily a duration of ten or
eleven days, rarely less. When small-pox is trans-
mitted by inoculation, the incubation period is shorter,
averaging only about a week.

Symptomatology.

In normal small-pox the course of the disease is
typical, and characterized in great measure by the
mode of evolution of the fever. Three periods have
been distinguished:

1. *Period of invasion.*—This period begins by a
violent fever, which is designated under the name of
prodromic fever, or fever of invasion. The rise of the
temperature, which is ordinarily announced by a chill
of greater or less severity, is excessively rapid, and
may reach 40° C. (104° F.) on the first evening of the
fever; the next day it may mount up to 41° or even
42° C. (105° to 106° F.) In the morning there is
usually a slight remission. This elevation of the
temperature is accompanied by the ordinary symp-

SCHEMATIC REPRESENTATION OF THE COURSE OF THE TEMPERATURE IN SMALL-POX.
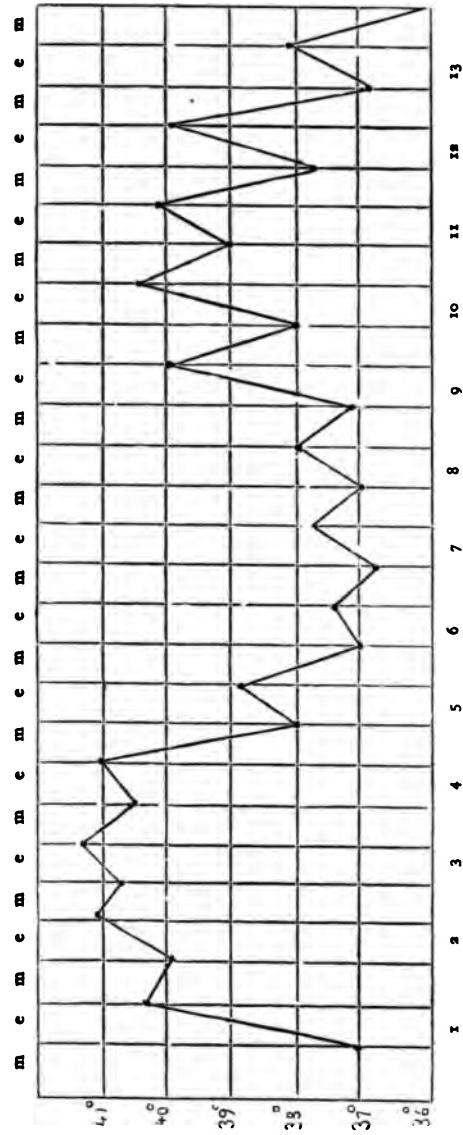
toms; great frequency of the pulse and respiration, thirst, anorexia, nausea and vomiting, a painful sensation of heat, lassitude, violent headache, restlessness and insomnia, very often slight delirium, and exceptionally, grave cerebral disturbances. The patient complains of a feeling of intense prostration and of severe aching pains in the dorsal and lumbar regions. There exists at the same time a catarrh of the nasal mucous membrane, conjunctivæ and throat; the latter is often very pronounced.

The rash begins to make its appearance about the third, or as late as the fourth day of the fever, and the outbreak of the exanthem is generally followed by a fall in the fever and a marked lull in the symptoms dependent thereon.

2. *Period of Eruption.*—The eruption appears first on the face, a little later on the neck, thorax and arms, and lastly on the abdomen and inferior extremities. At the onset it is discrete, but the little red points become thicker and thicker together during the following two days. The eruption is ordinarily more confluent on the face than on other parts of the body. The pock pimples are also more numerous on parts which are accidentally the seat of congestion, as regions to which have been applied sinapisms or cataplasms, and on those which have a thin epidermis.

The eruption begins by red spots the size of a millet seed, which may be effaced by pressure, and are often arranged in rings around hair bulbs or the

orifices of sweat glands. They soon form a slight
projection above the general level of the skin, and are
transformed into papules (papular stage). These
papules little by little are filled with liquid, become
enlarged in diameter, and elevated above the skin in-
to vesicles about the size and shape of peas (vesicular
stage).

These vesicles present a slight depression at their
apex (umbilication), which at a late stage is effaced
by reason of the accumulation of liquid. They are
partitioned in their interior, and a single pick is not
sufficient completely to empty them.

The septa, as well as the retinaculum which
produces the umbilication, are constituted simply
by the debris of the deep epidermic cells which are
dissocated by the liquid of the pustule, and the ves-
tiges of which remain in the state of lamellæ or tra-
beculæ (G. Simon, 1851; Aorpitz and Barch, 1863).

The cells of the epidermis soon begin to degener-
ate and present a cloudy aspect by reason of coagula-
ting necrosis, and little by little are transformed into
lamellæ of irregular form. In certain cases, the um-
bilication results from the presence of a hair follicle
or of a cutaneous gland in the centre of the pustule.

In many cases the exanthem also invades the
mucous membranes situated in the vicinity of the
outlets of the body, and in continuity with the skin;
the conjunctivæ, the nasal, buccal, pharyngeal mu-
cosæ, more rarely the larynx, trachea, and bronchi,

the œsophagus and rectum. On the mucous mem-
branes, the pustules are smaller and sooner attain
their complete maturity. They are mostly of conical
form, and are not umbilicated.

During the entire duration of the eruption, there
is a marked remission of the fever and a lull in the
general symptoms. Even in the grave forms, the
temperature may sometimes become completely nor-
mal for several days. But in the malignant forms, es-
pecially in confluent small-pox, this remission is but
little marked and of short duration.

About six days after the appearance of the rash,
the contents of the pustules, which hitherto were but
slightly cloudy, become by degrees completely puru-
lent. The pustule has attained its complete maturity
(pustular stage); it is surrounded by a red areola; this
is the *period of suppuration.*

In this period the pustules become still larger,
and are full of thick yellow pus. The limiting septa
and the umbilication disappear. When the pustules
are numerous and near together, they fuse into one
and become confluent (*variola confluens*), and there
are now produced veritable pockets full of pus, which
are soon succeeded by large thick scabs, which may
cover an entire region. This is what is observed es-
pecially on the face, hands, and other regions where
the rash is very much developed.

In other cases, even of true small-pox, the pus-

tules are relatively few in number and remain isolated (*discrete small-pox*).

The pock pustules at the time of suppuration are surrounded by an areola of a lively red color; the skin around them presents a considerable tumefaction, causing a feeling of tension and smarting which is very painful to the patient. The enormous swelling of the face, which is covered as with a mask, renders the patient unrecognizable, and the more so from the fact that the eyes, by reason of the tumefaction of the lids, are generally closed.

About the eighth or ninth day after the appearance of the rash, the redness and swelling of the skin begin to diminish and the pustules to dry up. At this stage it is not rare to see a new umbilication form. Most of the pustules burst and discharge their contents, and the dried pus forms yellow and brown crusts, of greater or less thickness, under which the skin is seen of a pearly whiteness.

At the moment when suppuration commences the fever is rekindled; it is not now like the fever of invasion, directly dependent on the infection, and it is to be regarded only as symptomatic of the inflammation of the skin—hence this fever has been designated under the name of *suppurative fever*.

In cases which are particularly grave, the temperature may rise to as great a height as in the fever of invasion. Ordinarily the fever is less intense, more irregular, and presents marked morning remissions.

In certain cases, even, it is noticed that the elevation of the temperature is not at all in proportion to the extension of the suppuration.

Generally, with the fever return all the other symptoms which habitually accompany it, especially the delirium, which often, in intemperate subjects, takes on the form of delirium tremens.

In cases with favorable termination, the suppurative fever ceases at the end of from three to five days. The general condition comes back by degrees to the normal, and the disease may be considered as having attained the term of its evolution.

About the fourteenth day of the eruption, the scabs begin to fall off (period of desquamation). Those elevated portions of the integument which have sustained a loss of substance by reason of the suppuration, present, after the fall of the scabs, a cicatricial tissue of new formation, of deep red color at the onset, projecting somewhat above the general level, which soon becomes pale, and is transformed into a very characteristic cicatrix, a little depressed in the centre, with jagged borders and whitish, punctate, and seamed base.

Under the name of varioloid, are designated the mild or abortive forms of small-pox, in which the third stage does not attain its full development. The suppuration, in particular, remains superficial, does not extend down to the derm, and consequently does not entail any sensible loss of substance. Hence it is

that varioloid does not leave any cicatrix, and the fever of suppuration is wanting or is insignificant.

From an etiological point of view, however, varioloid is identical with true small-pox. It manifests itself, preferably, in individuals whose receptivity is lessened by reason of a previous attack or of a former vaccination.

In certain cases the fever of invasion is as violent as in normal small-pox; sometimes even, the rash is so abundant as to excite apprehensions of confluent variola; but the pustules dry up before attaining their complete development, and there is no fever of suppuration.

In general, during varioloid the fever of invasion is moderate. The exanthem is more irregular than in typical small-pox, numerous pustules abort, and the pustules begin sooner to dry up. There remain, after the fall of the crusts, spots of a deep red hue, which disappear slowly, without leaving cicatrices. In the very mild forms, the eruption may be limited to a few pustules, or even be completely wanting, so that the disease consists solely in a febrile movement of comparatively little intensity.

Forms which are abnormal from the point of view of the general course of the disease are numerous.

In the stage of invasion, before the characteristic eruption appears, there is occasionally witnessed (and more so in some epidemics than others) a diffuse red-

ness, or a redness appearing in patches over the body, to which has been given the name of *prodromic rash or variolous erythema*. At other times, there take place under the skin little sanguineous extravasations, *petechiæ*, having for their seat of election the inferior part of the abdomen and the internal aspect of the thighs.

The erythematous eruption is observed principally in chronic cases, and is consequently of favorable augury. The petechial form, which it will not do to confound with hemorrhagic small-pox, is observed both in grave and in mild cases.

Under the name of *hemorrhagic or black small-pox* is designated small-pox complicated with a general hemorrhagic diathesis. Almost all patients who have this complication die.

This hemorrhagic diathesis may manifest itself coincidently with the period of invasion, by extravasations of blood under the skin, by hemorrhages of the mucous membranes and internal organs, in which latter event the patient sometimes dies even before the appearance of the eruption (*purpura variolosa*).

The hemorrhages do not declare themselves generally till the moment of the eruption. The papules and pustules are filled with a sanguinolent serosity; the skin presents between and around the pustules patches of purpura; at the same time, supervene hemorrhages of the mucous membranes, epistaxis, met-

rorrhagia, as well as hemorrhages into the serous cavities and various internal organs.

The development of the pustules may also present certain anomalies. In varioloid, the maturation of the pustules, as we have said, is often incomplete; the pustules are sometimes smaller than in typical small-pox, and are not ordinarily umbilicated. In certain rarer cases the liquid remains serous and contains no pus. It is to these forms that the name has been given of *crystalline, lymphatic, serous variola*, or, when taking its designation from the size of the pustules: *miliary, vesicular, pemphigoid variola.*

The vesicles may also dry up rapidly and go no farther than the papular stage. In certain forms, particularly malignant and rare, the skin in the intervals of the pustules and around them may be attacked with gangrene (*variola gangrenosa*). Lastly, gases may form in the pustules (*variola emphysematica*).

Complications and Sequelæ.

Grave variola is attended with numerous complications. A number of these depend more or less directly on the localization of the morbid process in the skin and mucous membranes. It is to this cause that we must refer the multiple furuncles and cutaneous abscesses, so frequent in small-pox, as well as the erysipelas and deep phlegmons which are much rarer; the ocular affections conjunctivitis and keratitis, with all

their grave consequences; the ear troubles, whether
provoked by an affection of the external meatus or by
a propagation of the inflammation of the pharynx to
the Eustachian tube; the ulcerations of the pharynx
and of the larynx, which may be the point of depart-
ure of a perichondritis, of a necrosis of the cartilages,
of œdema of the glottis. Pyæmic complications are
sometimes observed as a result of the suppuration, but
they are very rare.

The other secondary affections are to be referred
to the profound disturbances effected in the nutrition
of the tissues. When there has been hyperthermia of
long duration, there is generally found a parenchyma-
tous degeneration of divers organs, in particular of
the liver, kidneys, heart and striated muscles. On the
other hand, these degenerations are wanting in cases
where the elevation of temperature has not been very
prolonged, as in purpura variolosa.

The tendency to necrosis or to diphtheritic pro-
cesses in the throat and other mucous surfaces, which
is observed in the very malignant forms, and in hem-
orrhagic small-pox in particular, belong to the same
order of facts, as well as the bed sores and gangrene
in other regions.

Sometimes, also, suppurative parotiditis super-
venes as a complication. In some cases, which are quite
frequent in certain epidemics, there occurs an acute
inflammation of one or more joints with serous or sero-
purulent effusion.

Note also the frequency of bronchial catarrh, which, especially in children, readily undergoes transformation into catarrhal pneumonia. There have also been noticed as complications: croupous pneumonia, pleurisy, in rare cases, pericarditis or ulcerous endocarditis, diffused or focal lesions of the brain and spinal cord, mental affections, peripheral paralyses, etc.

When the disease has been grave there remains for a long time a considerable degree of emaciation and general enfeeblement, with sometimes a tendency to dropsical effusions.

PROGNOSIS.

In attempting to formulate a prognosis at the onset of the disease, great account must be made of the degree of receptivity which the individual presents at the time of the attack. In subjects who have been vaccinated, there is every reason to expect that the course of the disease will be mild.

The manner in which the fever of invasion pursues its course may furnish prognostic signs of some importance. If this is moderate, it is probable that the disease will be light. On the other hand, a violent fever may precede an attack of discrete as well as of confluent small-pox.

The aspect of the eruption also furnishes precious indications. Hemorrhagic or black small-pox is almost necessarily mortal. Confluent small-pox, especially when the eruption extends over a large sur-

face, is of very grave prognosis. The discrete variety, on the other hand, almost always terminates favorably, and varioloid may be considered as an affection without gravity.

The physician should also take account of the intensity of the fever in the stage of suppuration. A violent fever in this period is of unfavorable augury, while a temperature lower than one would expect from the general state of the patient in confluent small-pox, is of still more inauspicious prognosis. A very extensive and confluent eruption seems, in fact, to have for its result to depress the temperature of the body, and provoke at the same time grave functional troubles—delirium and profound collapse; we witness here, in fact, what we observe in large burns or extensive lesions of the skin in which death supervenes with a temperature below the normal. The gravity is naturally in proportion to the extent of the lesions.

The disease is more serious in young children and in old men, than in individuals in full maturity and vigor. Pregnancy and the puerperal state make the prognosis much worse.

The mortality of an epidemic depends especially on the number of vaccinated individuals who are attacked; in the non-vaccinated, it is ordinarily 20 per cent. and even more, while it is much less in the vaccinated.

When small-pox prevails in a population not protected by vaccination, it makes frightful ravages. It

is not rare to see entire tribes of savages disappear as the consequence of an epidemic of small-pox.

The first epidemic which appeared in Mexico, shortly after the discovery of this country by the Spaniards, made more than three and a half millions of victims.

TREATMENT.

The prophylaxis of small-pox includes two orders of means. The first are such as are put in usage in all contagious diseases. The more completely you succeed in isolating individuals affected with the disease, thus preventing all direct or indirect communication with individuals who have not been exposed, the more certainly will you prevent the extension of the malady. This isolation, even when it can be only imperfectly effected, is practically of capital importance. Whenever it is possible, small pox patients should be treated in a private hospital where they can receive no visit from outsiders, and where even the attendants can have no communication with the outside world. All persons that are liable to contract the disease, however slight may be the predisposition—such as non-vaccinated new born children—should be kept at a distance from quarters where the epidemic is prevailing.

The medical attendant will institute a thorough disinfection of all objects which have been in contact with the patient. Things of little value should be

burned. Other effects, such as clothing, bed clothes, should be soaked in boiling water or subjected to the action of steam or of dry heat at 250° F., care being taken in the latter case to leave the objects a long time exposed to the heat.

The sick room should be disinfected by means of sulphurous acid vapors, and to effect this a sufficient quantity of sulphur, two to four pounds at least, should be burned in the room, the doors and windows being shut. The floors, walls and furniture of the room should be cleansed with a hot sublimate solution.

The second means at the disposal of the physician for prevention of small-pox is quite special to this disease. It consists in giving to healthy individuals a veritable immunity, and rendering them refractory to the infection.

This result may be attained by inoculating the small-pox virus, and the individual thus obtains the immunity which a first attack of the disease confers, (variolic inoculation). But there is another virus, specifically different from that of small-pox, which attains the same end, namely *vaccine*, and as this determines an affection which is much milder than small-pox, it is to *vaccination* that we now have recourse. Since this practice has been extended to all civilized countries and applied with more or less perseverance and rigor, small-pox no longer inspires the terror that

it once inspired, and it has become a malady rela-
tively rare and much less dangerous than formerly.

Inoculation for small-pox as a means of preserva-
tion seems to have been employed from the most re-
mote periods in India and in China. This method,
brought from Constantinople and introduced into
England for the first time by Lady Mary Wortley
Montague in 1721, soon became almost universal.

The benignity of the small-pox produced by the
inoculation (statistics give one death in 300 to 500 of
the inoculated), proves, what seems at first sight quite
paradoxical, that a disease artificially provoked is a
means of preservation against the spontaneous assaults
of this disease. One· may even, as was shown by
Thiele for small-pox at Kasan in 1839, and quite re-
cently by Pasteur for other microbiotic diseases, at-
tenuate by special processes the pathogenic agents, so
that the disease provoked by the inoculation remains
a benign affection, while conferring an almost abso-
lute immunity.

The variolic inoculation was not without serious
disadvantages. The inoculation not being practised
by everybody, those who did not subject themselves
to the operation were constantly liable, by contact with
the inoculated, to contract the disease, from the fact
that the practice of variolization made those inoculated
so many foci of contagion.

In 1796 an English physician, Edward Jenner,
made a discovery which, in consideration of the conse-
quences which have followed it, must be regarded as
the most brilliant triumph of therapeutics. Although
facts which led to his discovery had been before
pointed out, it is none the less to Jenner that all the
honor belongs, for he was the first to establish by ri-

gorous experiments that vaccine, a disease peculiar to
the cow, may be inoculated in man, and that this ino-
culation confers on him the same immunity as the
variolic inoculation, while causing but an insignificant
constitutional reaction.

As a consequence of the first publications of
Jenner (1798-1800) his method rapidly became popu-
lar. The first vaccination was made in London in
1799, and in 1800 Jenner's method had spread to
France and Germany.

To-day, in all civilized countries, the service of
vaccination is an institution of the state, and in most of
them vaccination is rendered obligatory by law. The
history of vaccine and of vaccination will be the sub-
ject of a special chapter.

The treatment of small-pox when established
should be both expectant and symptomatic.

During the fever of invasion, the patient should
be kept in bed on low diet, in a moderately warm at-
mosphere, and should be allowed plenty of cooling
drinks and diluents. When the fever is very high and
the morning remissions are but slight, the attempt
may be made to combat the hyperthermia by cold
baths and large doses of quinine, especially if the in-
dications seem to be strongly urgent.

Formerly there was a prevailing sentiment that the indi-
cation was to facilitate the coming out of the eruption by keep-
ing the patient in a very warm room, and even by promoting
active diaphoresis; this was to be done with a view of ridding
the organism of the poison as completely as possible, and this
practice still prevails in certain countries. Sydenham saw the
bad effects of this method in the epidemics of 1667-1669. But

he was unable, despite all the authority of his name, to bring the general public, and even physicians, to common sense principles and to overcome their prejudices against the refrigerant treatment, and he was obliged to content himself with the hope that the future would do justice to his keener, more rational penetration: "*obtinebit demum me vita functo.*"

We know of no specific medicament which can act directly on the virus of small-pox, and prevent or even moderate the eruption. The internal administration of phenic acid in quite large doses (one to two grammes a day in pills) in the period of invasion and at the beginning of the eruption may possibly give results of a favorable character. Xylol may also be tried. (Zulzer). [Antipyrin in gramme doses will calm the nervous disturbance and allay the fever.]

It may be possible to abort the eruption in certain regions, and particularly on the face, by the application of cold compresses or mercurial plaster. To prevent the development of certain pustules which from their situation might be particularly disagreeable and unsightly, it is a good plan to open them early, and having emptied them of their contents, to cauterize them with the solid stick of nitrate of silver.

Frequent inunctions with oil, applications of compresses saturated with oil or glycerine during the entire period of the eruption, will serve to diminish the tension of the skin and give relief to the patient.

In certain cases, tepid or warm baths long-continued may also be useful.

When the eruption is very extensive and very intense, the administration of mild purgatives (infusion

of senna, castor oil, etc.) seems to have a favorable in-
fluence on the general condition.

In the stage of suppuration, the treatment should
have chiefly for its end to prevent certain formidable
complications. If the suppurative fever is very high
and presents no marked morning remissions, quinine
should be given in large doses, although its action is
much less certain in these cases than in other pyrexial
conditions.

The signs of enfeeblement of the heart and
threatening asystolia demand the employment of al-
coholic and other stimulants.

For the complications of the mouth and throat
one should resort to stimulants and antiseptic gargles.

CHAPTER VII.

VACCINE AND VACCINATION.

Vaccine is a disease which is peculiar to the cow, and is characterized by an eruption of pustules on the udder and teats of the animal. This affection may be transmitted to man by inoculation, and may then be communicated in the same manner from one person to another. The contagium, as far as man is concerned, is a fixed contagium, and it is only very exceptionally, if ever, that it is transmitted spontaneously to man. *

Opinions are still divided on the question, no less interesting from a theoretical than important from a practical point of view, respecting the nature of vaccine. Is vaccine a disease specifically differing from small-pox, or is it only small-pox modified?

Most observers are to-day of the opinion that the disease under consideration is only small-pox transformed by its passage through an animal organism, and, when conveyed to the human body, taking on he characters of vaccine. This view is not in harmony with experiments which go to show that the infectious diseases preserve their proper characteristics with almost absolute constancy in the most diverse circumstances. We see organisms, it is true, to whatever degree of the animal scale they may belong,

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* The disease is said to have been communicated otherwise than by inoculation in the case of some of the lower animals. Thus, Chauveau succeeded in producing some of its phenomena in the horse by causing the virus to be inhaled in the form of spray.

Dr. Frank P. Foster in Pepper's Syst. of Med., vol. 1, p. 455.

undergo notable modifications in their general characters under the influence of a change in the culture-environment or other biological conditions, and the same is true of the microbes of infectious diseases, but when they are transported anew to their original soil, they regain all their primary characters and properties. Now since the time that vaccine was first transmitted from man to man, has any body ever seen one case, out of the millions which have passed under observation, where vaccine has been transformed into variola? This fact of itself suffices to prove the specific difference between the two kinds of virus. If vaccine were only an attenuated small-pox, modified by its passage through the organism of a cow, its return to its original culture field ought to bring about, either immediately, or after several generations, the reappearance of its primitive characters, and this has never yet taken place.

Moreover all experimental researches made with sufficient rigor and precision, such, in particular, as those of the Lyonnese Commission (Chauveau, 1865), support the difference in nature of the two diseases. Vaccine, when transported from man to the cow, takes on after several generations, all the characters of cow-pox. On the other hand, if we inoculate calves and horses with human small-pox, we have an eruption quite different from that of vaccine, and when we convey it back again to man, we never produce vaccine, but always true small-pox. The Lyonnese physicians inoculated ten children with lymph from pustules of small-pox which had been produced artifically in animals, and this inoculation gave rise to an eruption of typical diffuse small-pox. In six of these children, the small pox was confluent, and one of them died of the disease; another communicated small-pox to the mother and to a small child. These experiments, whose validity no criticism can impeach or overthrow, compel us to call in question the accuracy of certain observations according

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to which small·pox communicated to calves is said to have
provoked a simple vaccine disease in man (Thiele & Ceely).

As for certain more recent experiments tend ng to prove
that variola may be transformed into vaccine, they are far
from being demonstrative. We may then regard as established
the specific difference between small pox and vaccine.

Vaccination is generally performed by making
pricks or superficial incisions with a lancet which has
been dipped in the lymph of a vaccinal pustule. The
place chosen is generally the outer side of one or both
arms, at the junction of the upper with the middle
third. The pricks should be at least four in number,
about four centimetres apart. The incision should
include only the epidermis, and the operator should
avoid all flow of blood; at the most, only a little oozing
should cover the point of insertion of the lancet after
the operation.

[The American method is to scratch through or
abrade the horny layer of epidermis with lancet or
rake-toothed vaccinator, and over such scratches or
abrasions rub a moistened ivory point or quill which has
previously been charged with animal or humanized
lymph. The abrasion is easily effected with an ordinary
venesection lancet, the convex part of its edge simply
scraping the cuticle. The latter method is the one
recommended by Foster in the American System of
Medicine.]

The first vaccination should be made in infancy,
the age of six to eighteen months being the preferable
season for the operation, the child being in a good

state of health at the time. It is better not to vaccin-
ate during the heat of summer or the cold of winter;
the most appropriate time is the beginning or the end
of the summer. All such considerations, however, are
of course not to be taken into account in a time of
epidemic, when all unvaccinated infants and other un-
protected persons, and even sick people who are liable
to exposure, should without discrimination be vac-
cinated.

If the inoculation does not give well-developed
pustules, the operation should be repeated after a
short time. The choice of the subject from whom the
vaccine is to be taken is of capital importance. Ob-
servations which are sufficiently numerous prove that
syphilis may be transmitted by vaccination, and this
is more likely to occur when the blood of a syphilitic
vaccinifer is accidentally mixed with the vaccinal
liquid. As for the possibility of transmission by pure
vaccinal lymph, this question has not yet been definitely
decided, despite the numerous experiments and in-
vestigations which have been made in this direction.

However this may be, children should always be
selected as subjects for furnishing vaccine in whom a
minute and careful examination has disclosed no trace
of cutaneous or glandular disease, and whose parents
are above all suspicion on the score of syphilis The
vaccinator, besides, will avoid as far as possible the
admixture of blood with the lymph. As hereditary
syphilis may remain latent till past the third month, it

is better not to take vaccine from children under six
months of age.

It will not do to forget, moreover, that there is
another mode of transmission of syphilis, from which
not even animal vaccine protects. When several
children are vaccinated, the one after the other, and
the operator does not take care to thoroughly disin-
fect his lancet after each vaccination, it may happen
that a little of the blood of a syphilitic infant remains
adherent to the instrument, and that the child next
vaccinated may be thereby contaminated.

It is possible also that erysipelas may be trans-
mitted by vaccination. As for the transmission of
other diseases, the observations which we have on this
subject are far from being demonstrative. The phy-
sician can not be too careful and particular in this
matter, and he will scrupulously reject, as a vaccinifer,
every child affected with scrofula or tuberculosis, as
well as every one whose parents are known to have
had or to be suffering from any contagious affection.
He should take vaccine only from those pustules
which have arrived at their full development; and only
individuals vaccinated for the first time should be
selected as vaccinifers, no other vaccine being at all
reliable. It is from the sixth to the seventh day after
vaccination that the activity of the vaccinal lymph is
the greatest.

The method the most simple and the most cer-
tain is vaccination from arm to arm. Vaccine may,

however, be kept for a long time without losing its activity in capillary tubes sealed with wax or by a spirit lamp. The admixture with glycerine (one part of lymph, two of glycerine, and two of water) does not impair the efficacy of vaccine. Lastly, vaccine may be dried and kept between two plates of glass previously disinfected; it should be rubbed up with water or glycerine before being used, but such vaccine soon loses its power.

Lancets employed for vaccination should be kept clean and disinfected before each operation, either by being dipped into boiling water, or washed with alcohol or carbolic acid.

Within a few years, under the pretence that in order to preserve the activity of vaccine it is necessary to reenforce and improve it from time to time by going back to its original source, and that it is even preferable whenever possible, to obtain vaccine directly from the cow, prominent medical gentlemen in various parts of the world have brought about an agitation in favor of animal vaccine. An agitation of this sort is surely legitimate in principle, and may have a certain utility, but it is necessary to bear in mind that the end aimed at by some of the advocates of animal vaccine has not always been exclusively scientific, and that extravagant and exaggerated statements have been put forth in defence of animal against humanized vaccine.

The notion that it is necessary to renew vaccine supposed to have become degenerated by long transmission through innumerable human organisms, and that this must be effected by conveying it back again to the animal from which it was originally taken, is based on this fact, the exactness of which certainly cannot be impugned, that the immunity con-

ferred by vaccine is not as absolute as was at first believed.
It has been found by experience that the protection of vac-
cine lasts only a certain time, and from this fact, persons have
argued that there has been an attenuation, or enfeeblement
of the activity of the specific virus. Vaccine taken directly
from the animal, they say, must be more active and reliable.
These assertions, we do not hesitate to pronounce alto-
gether theoretical, and not based on facts. Thus far hu-
manized vaccine has not shown any sign of degeneration, and
there is not the least proof that the original cow pox confers a
more complete or lasting immunity. The tentatives which
have been made to employ vaccine taken from the cow, and the
establishment of animal vaccine institutions, none the less,
however, deserve to be encouraged It is a good plan, more-
over, from time to time to inoculate cattle with human vaccine,
and thereupon to use the lymph of the pustules which develop
on the animal for human vaccination.

As for the desirability of going in quest of the original
cow pox, this seems to me to be beset with difficulties from the
fact that in many cases this cow pox, so-called *spontaneous*, is
nothing but vaccine accidentally transmitted from man to the
cow.

Another consideration has also been adduced in favor
of animal vaccine. I refer to the possibility of communica-
tion of syphilis and perhaps, also, of other diseases, such as
tuberculosis, by human vaccine. In employing animal vac-
cine the physician is surely guaranteed against syphilis, and
he can know with certainty whether the animal is tuber-
culous by killing it and examining the viscera before using
the vaccine. As for other diseases which may be trans-
mitted from the animal to man, we are in complete ignor-
ance on the subject. As contrasted with the millions of in-
dividuals who have been innoculated with human vaccine,
(and most of them with no untoward results whatever), the

number of persons who have been innoculated with animal vaccine is very small, and it is not at present possible to establish a comparison between the two methods from the point of view of safety and danger.

Animal vaccine being very much in fashion at the pres ent time, it is quite possible that at no late day comparative statistics embracing the two methods may be made, and I should be in no way surprised if these statistics should appear quite to the disadvantage of animal vaccine. It seems to me, from my standpoint, that a physician has much more guaranty of security in taking his vaccine from a child whom he can carefully examine, whose antecedents and parentage he knows, than in making use of a vaccine liquid coming from an Institute, worthy of entire confidence it may be, but over which he has no control. Add, that inoculation from one arm to another never fails when the individual is in a state of receptivity, while experience shows that with animal vaccine there is a considerable proportion of failures and negative results, and you have a strong case for humanized vaccine.

I am then far from sharing in the view that it is better always to have recourse to animal vaccine, and am inclined to give a general preference to human vaccine, though circumstances may justify a resort to the bovine virus.

On the other hand, it must be admitted that in consequence of the hold which animal vaccine at present has in communities, the position of the physician may be somewhat embarrassing, and I know that many practitioners are not a little shy of the animal vaccine institutions.

The protection which vaccination gives begins with the day when the vaccinal pustule attains its full development. If the individual at the time of vaccination happens to be in the incubation period of small

pox, the latter continnes its development and pursues
its natural course coincidently with the vaccine, though
it is generally rendered somewhat milder by the latter.

The immunity acquired by vaccination is only
absolute and complete for a limited period. At the
end of a few years (sooner or later, according to the
individuals) the protective power is lost. Hence it is
that it is necessary from time to time (about every ten
or twelve years with most persons), to undergo re-
vaccination. There should be less disposition to de-
fer these revaccinations from the fact that they are
perfectly harmless, even if useless, and supposing that
at a later day the revaccinated person should contract
small-pox, the disease will be much lighter in conse-
quence.

Symptoms and Course.

The vaccination-scarifications present nothing
particularly worthy of notice the first day. About the
second, oftener the third day, there appears about
these points a slight redness and a little swelling.
About the fourth or fifth day a vesicle forms, which
grows till the seventh or eighth day, and becomes
transformed into a veritable pustule, which, like that
of small-pox, presents an umbilication and a cellular
structure. The contents become little by little puru-
lent. From the ninth to the tenth day each nodule is
surrounded by a red and tumefied areola. About the
eleventh day the redness and swelling begin to dimin-

ish and to disappear; the pustule by degrees dries up and the scab falls about the twentieth day. In its place there remains a red spot which is gradually transformed into a cicatrix, which is a little depressed, whitish, dotted, and much resembles that of small-pox. This cicatrix remains during life.

From the eighth to the ninth day there is ordinarily a well-marked febrile movement, in which the temperature may sometimes mount up to 104° F., and even higher, and is accompanied by the usual symptoms of reaction. This fever runs its course like an ephemeral fever, and lasts only one or two days.

Complications.

Sometimes, though very rarely, an attack of erysipelas supervenes as a result of vaccination. This erysipelas pursues its course like traumatic erysipelas, and may even, in some cases, present a certain gravity. This complication may with certainty be avoided by taking care to procure vaccine from a perfectly healthy infant, and by keeping the vaccination lancet always disinfected.

As for other modes of infection, the chances are no greater in vaccination than in other lesions of as trifling a nature. Lymphangitis, adenitis, furuncles, ulceration of the pustules, have also been spoken of as possible consequences of inoculation.

In individuals predisposed to eczema, the inoculation of vaccine virus, like every irritation of the

skin, may serve as the occasional cause of the develop-
ment of a vesicular eruption.

The same may be said of erythema and urticaria,
but these complications have no importance. Lastly,
one will sometimes witness, as a sequel of vaccination,
the outbreak of the cutaneous manifestations of dia-
theses previously existing, such as scrofula.

The innocuousness of vaccine is demonstrated by
statistics, which show that among vaccinated children the
mortality in the three weeks which succeed vaccination is
sensibly below the average mortality of children of that age.
This lessened mortality ought not, of course, to be put to the
account of vaccination, being really due to the fact that only
healthy children are vaccinated, and that vaccinated children
are uncommonly well cared for in the days which follow the
operation; it does, however, go to show the harmlessness of
vaccination.

A Society, composed of persons who might properly be
called "cranks," with little knowledge of medicine and less of
great historical movements, re enforced by certain physicians
and quacks who are strangers to small-pox and small-pox
epidemics and absolutely incompetent to weigh scientific
evidence, has of late raised a hue and cry against vaccination,
asserting not only that it is useless for protection, but that it is
"morbigenous" and responsible for manifold evils.

This agitation has had a certain influence among the
ignorant and lower classes, especially in countries where, by
reason of the immunity acquired by long and thorough vac-
cination, small-pox has become almost unknown. It is a
significant fact that when an epidemic of small-pox, makes
its appearance, these anti-vaccine agitators are less noisy and
rampant, and are generally the first to seek the protection
of vaccination. For my part, I did not fail to foresee what

has literally happened in the Swiss Cantons where compulsory vaccination was vetoed by the suffrages of the people, the result of which has furnished an instructive but melancholy commentary on this senseless opposition, a grave epidemic of small-pox having lately raged among the non-vaccinated of that country at a time when epidemics had become almost unknown among civilized nations.*

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*The lesson of Montreal (1885–1886) will not soon be forgotten. A frightful epidemic prevailed for several months among the non-vaccinated (chiefly French Canadians), carrying off thousands. The protection conferred by vaccination was evidenced by the exceedingly small mortality among citizens who at some time of their life had been vaccinated; the English speaking portion of the population hardly felt the epidemic, and those who submitted to vaccination had complete immunity. So strong was the opposition to vaccination on the part of the masses of French Canadians (an opposition aided and abetted by a few physicians who were careful to keep away from the contagion) that the city authorities found it impossible to enforce vaccination regulations, and the epidemic raged till it spent itself.

In the Prussian army from 1825 to 1834 there was an average annual mortality from small-pox of 45. Since 1835, the date of a rigorous enforcement of vaccination and re-vaccination regulations, this mortality has dwindled down to a yearly average of 2.27 from small-pox, and during certain years, notably 1847, 1855, 1856, there was not a death from small pox. The results of vaccination in the French and English armies have been equally demonstrative.

Finally, it may be well to remark that in the United States, physicians of late years have generally resorted to animal vaccine as a protection against variola, not so much because they think that its superiority over humanized vaccine has been demonstrated, as because it is theoretically safer, and because it is generally more easy of obtention, there being numerous establishments of a perfectly reliable character ready to furnish supplies on brief notice. These houses make a specialty of cultivating cow pox matter of a perfectly pure quality; their "points" are always charged with a colorless lymph, all admixture of vaccine with pus or blood being scrupulously avoided. Trans.

CHAPTER VIII.

VARICELLA.

Varicella (chicken-pox) is a specific affection, differing from small-pox and from vaccine. The contagion of variola never produces varicella, nor, on the other hand, does the contagion of the latter disease ever engender small-pox. Varicella attacks individuals that have been vaccinated, as well as those that have had small-pox, and an attack of varicella confers no immunity from the latter disease. Besides, it is quite exceptional for a person to have varicella a second time.

Some authorities, as Hebra, by a perverted use of the word, designate the milder forms of varioloid under the name of varicella. These kinds of varicella properly belong to the category of variola.

Varicella is easily communicated to healthy children by contact with children affected with the disease.

Inoculation with the liquid of the pustules, however, generally gives only negative results. This disease is almost exclusively confined to infancy and early life, being very rare in adults. It generally attacks several children in the same family or belonging to the same school, either simultaneously or successively.

The duration of the incubation, from the moment

of exposure till the appearance of the exanthem, is from thirteen to fifteen days, according to my observations.

The eruption appears irregularly on different parts of the body, often invading one part after another. First of all red spots come out, on which, in the course of twenty-four hours, are developed vesicles the size of a small pea, though of various dimensions, always discrete, of rounded form, sometimes flattened, sometimes conical.

The liquid of the vesicles is serous, and becomes later slightly turbid by reason of the presence of a little pus.

The pustules dry up on the following days, and the scab falls off; rarely a flat, whitish, smooth and round cicatrix remains. Occasionally little pustules are seen in the mouth and throat. The other mucous membranes are much more rarely affected.

A little fever habitually accompanies the outbreak of the rash, as well as some slight disturbances of the general health, but these symptoms of reaction are of transient duration.

The diagnosis between varicella and varioloid does not generally present much difficulty. Even in the most benign forms of the latter affection, there is a fever of invasion which is very characteristic, which lasts several days, and which disappears with the outbreak of the rash. In varicella, on the contrary, the elevation of temperature is seen only at the moment

of the eruption, or a very short time before. The aspect of the pustules, of which the liquid in varicella is much less purulent than in varioloid, is no less characteristic. It is also necessary to take account of the rarety of this affection in adults.

Lastly, in certain cases, the fact of the patient having been exposed to the contagion of small-pox, and the greater or less receptivity presented by him at that time, may clear up the diagnosis.

Most cases of varicella escape the observation of the physician. The disease itself requires no treatment, and it is sufficient to keep the patients in bed during the existence of the fever.

CHAPTER IX.

RUBELLA (ROTHELN).*

Rubella (Rötheln, German measles) is an acute eruptive fever, differing especially from measles and scarlatina. It prevails epidemically, sometimes coincidently with the latter diseases, but frequently also at periods that are exempt from these affections. The disease is propagated by contagion, and attacks children chiefly, though rarely adults. A first attack gives immunity from further attacks of rotheln, while, on the contrary, giving no protection against measles and scarlatina.

Certain authorities regard rötheln, not as a specific disease, but as a mild torm of measles or scarlatina. or as even a mixed form, resulting from hybridization of these two diseases. This is in particular the view of hospital physicians who rarely have an opportunity to observe true rotheln. Rubella is, in respect to measles and scarlatina, not what varioloid is to small-pox, but what varicella is to this latter disease. Rötheln and varicella are invariably mild exanthems.

The incubation period of rubella is of very long duration, varying from two to three weeks. The dis-

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* The name *Rubeola* has been used as a synonym, but as good usage has sanctioned its application to true measles it would be better that this word should not be employed to designate the exanthem here under consideration. I have substituted another synonym for which there is good medical authority—*Rubella.*—TRANS.

ease manifests itself principally by a rash, which gen-
erally begins on the face, and spreads to the rest of
the body. This exanthem is characterized by circum-
scribed red spots from the size of a pin's head to that
of a pea, slightly projecting above the level of the skin,
at the onset completely disappearing under the pressure
of the finger. These spots rapidly grow pale, and dis-
appear at the end of two or three days, generally with-
out being followed by desquamation. At the moment
of the eruption, sometimes a little before, there is a
little fever with general malaise; at other times fever
is entirely absent. Often, moreover, there is slight
catarrh of the mucous membrane of the nose, the con-
junctiva, the respiratory passages, the mouth and the
throat. A little cough, sneezing, photophobia, lassi-
tude, diminution of appetite, are symptoms which
habitually precede the eruption.

The greater number of cases escape the observa-
tion of the physician.

Rest in bed and a sparing diet constitute all the
treatment which the disease requires.

CHAPTER X.

DIPHTHERIA.

Diphtheria is a contagious disease, not attended with cutaneous eruption, which is primarily local, and of which the infectious agent ordinarily localizes itself upon the pharyngeal mucous membrane, more rarely, on other mucous surfaces in the vicinity of orifices, or on wounds, and there causes a specific exudation which results in necrosis of the tissues.

This local infection is followed, in a great number of cases, by a general infection, with morbid determinations to divers organs, by reason of the penetration of the poison into the blood.

The name of diphtheria ($\delta\iota\varphi\theta\varepsilon\rho\alpha$ *skin, membrane,*) was applied for the first time to the disease in question by Bretonneau in 1826, and under this name he included croup. Since then, Virchow has shown the differences which exist between the croupous inflammations of mucous membranes, in which a semi-solid exudation is deposited on the surface of a sound mucosa, and diphtheritic inflammation, in which the exudation takes place in the very substance of the mucous tissue, as well as on the surface, and brings about a necrosis of this membrane.

We have examples of this diphtheritic process in the neo-membranous productions of the intestine in dysentery, in those of scarlatina and mercurial stomatitis, and to day this term is reserved exclusively for this anatomo-pathological alteration. It is only by

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reason of the fact that the name diphtheria has be-
come riveted by habit to the disease in question, that
it is used, a little out of its accepted signification, so
exclusively to designate the pseudo-membranous affec-
tion we are about to describe.

Are croup and diphtheria one and the same af-
fection, or do they constitute two distinct morbid
species ? This is a question on which authorities are
far from being agreed. It is certain that in the dis-
ease of the larynx to which has been given the name
of croup, there may be a diphtheritic infiltration of
the mucosa, and that, on the other hand, in true diph-
theria sometimes false membranes form which per-
fectly correspond to the anatomical definition of
croupous membranes.

But the question is for us chiefly etiological and
not exclusively anatomical, and what we want to know
is if the disease designated under the name of croup
is caused by the same pathogenic agent as diphtheria.

Bretonneau was led to regard the two diseases as
identical, and this view is still that of many medical
authorities, and especially those who have had oppor-
tunity to observe a great many cases of diphtheria.
But one may well ask, without calling in question the
experience and competence of these observers,
whether they were really in the most suitable condi-
tions for obtaining a solution of this problem.

When diphtheria and croup prevail at the same
time in a locality, it is impossible to establish a cor-
rect diagnosis between the two diseases, and there is
in consequence a strong disposition to admit their
specific identity.

On the other hand, the numerous and well-estab-
lished facts in which cases of croup have been ob-
served at times and in places where diphtheria was

unknown, seem to us to give a presumptive proof of the specific difference of the two diseases. It is on such arguments as these that we are compelled to deny scarlatinous diphtheria a place in the same category with diphtheria properly so-called.* .

Hospital gangrene, which has often been regarded as the diphtheria of wounds, and as identical, therefore, with diphtheria of the throat, must for the same reasons be considered as a specifically different affection. ·

It is extremely important from the point of view of therapeutic indications to know if diphtheria is a general or a local disease. The opinion most generally held is that it is at first a local affection, and that it is only secondarily that it becomes general. This does not, however, militate against the view that in certain exceptional cases the infectious principle

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* The attempt to distinguish·croup and diphtheria as two entirely distinct diseases has been unsuccessful, both from an anatomical and from a clinical stand-point; indeed there are a good many reasons for supposing that these two affections are only varieties and modifications of one and the same process, which in consequence of special influences and collateral causes, as yet imperfectly understood, makes its appearance at one time as croup, at another as diphtheria; now in a sporadic form, now as a widespread epidemic, now as a primary, now again as a secondary affection.

Every person who has observed many cases of croup and diphtheria must admit that these two affections often occur together, or successively, in the same person; that the throat not infrequently presents the signs of typical diphtheria at the same time that true croup is found on the mucosa of the larynx and lower air passages; that in the larynx itself croup and diphtheria are observed to shade into each other; and that finally constitutional symptoms, fever, glandular enlargements and albuminuria are met with during the course of croup as well as in diphtheria.—Steiner in Ziemssen, Vol. 1, p. 234.

may first penetrate the blood and [bring about a general infection before it produces any local external manifestations.

Diphtheria, as the descriptions of Aretæus and Aetius inform us, was known to the ancients. Later it was confounded with croup and scarlatinous diphtheria. We find, however, here and there among the ancient authors, descriptions of epidemics of malignant or gangrenous angina which certainly were of a specially diphtheritic nature, and in which we note that well-known erratic tendency of the disease, which sometimes disappears completely and for centuries from a country where it formerly prevailed epidemically, while at the same time spreading to other countries and invading regions where it was before unknown.

Thus it is that we have the account of a devastating epidemic which raged in the sixteenth century in the valley of the Rhine, from Switzerland to Holland (at Basle in eight months there were two thousand deaths). The epidemic became extinct in this region about the end of the century, when it spread to Spain and Italy. At a more recent epoch we find mention of several local epidemics in different parts of Europe.

The great extension of diphtheria dates from 1820, an epoch when a severe epidemic broke in France. From there the disease was progagated to England, Northern Germany, North America, and since 1860 it has invaded Southern Germany and Switzerland.

Actually at the present time diphtheria is endemic in the greater part of the civilized world, and from time to time takes on an epidemic character with wide-spreading tendencies.

Etiology.

The disease may be directly transmitted from a sick person to a healthy person. This is especially likely to be the case when, in consequence of immediate contact with a diphtheritic patient (as during fits of coughing), portions of false membrane from the mouth or throat are accidentally projected upon the mucous membranes of the mouth or nares of healthy individuals. It is in this way that physicians and nurses are often infected by children whom they are attending. The number of members of the medical profession who have been victims of the disease contracted in this manner is already too large.

In a great majority of cases, the infection is communicated indirectly, without any immediate contact with the patient.

The infectious agent of diphtheria appears to be endowed with a great resistance to external influences. Bed rooms where persons affected with the disease have been confined may preserve the infectious principle with all its virulence for a long time. There are cases on record where the disease has been contracted by entering such rooms after the lapse of weeks, and even months. There will be houses and localities where you will witness from time to time the outbreak of cases of diphtheria, which it is very difficult to refer to a recent contagion.

In most instances, moreover, it is impossible, to

discover by what way and in what manner the infection is contracted. In places where diphtheria is endemic, the means by which contamination can be effected are too numerous and too various to render it possible often times to ascertain the source of the contagion.

The disease often prevails epidemically; at such times you will see appear, either simultaneously or successively, a series of cases within a quite limited area. At other times the cases are so scattered that it is difficult to perceive the connection between them, and such cases are generally regarded as sporadic.

Climate, seasons, meteorological conditions, have no well marked influence on the spread of epidemics. At the same time, the disease is more frequent in the spring, and seems favored by damp cold weather; this may be due simply to the fact that catarrhal inflammations of the throat, which constitute a manifest predisposition to diphtheria, are more common at this season.

The composition of the soil plays only a secondary part; lands habitually moist, and containing organic matters in a state of decomposition, nevertheless seem particularly favorable to the propagation of the disease.

The same may be said of the massing together of numerous individuals in small, mean, and badly ventilated tenements. This it is that explains the predilection of diphtheria for the poorer classes.

Children of from ten to twelve years of age have a receptivity much greater than adults. The disease, however, is far from being infrequent in adults, and in some epidemics the latter furnish as many victims to the disease as the former. Predisposition to sore throat (quinsy), hypertrophy of the tonsils, seem to constitute conditions particularly propitious to the development of the diphtheritic germ.

A first attack gives no immunity from subsequent attacks, and relapses are far from being rare.

In the present state of science it is regarded as more and more probable that diphtheria, like the other infectious maladies, is linked etiologically to the growth and multiplication of a micro-organism. Numerous microbes have in fact been found in diphtheritic membranes. But the most careful researches have not yet succeeded in detecting with certainty among the multitude of bacteria which live upon the false membranes, the one which is the specific agent of the disease, and in distinguishing it from such as are accidental or which develop secondarily upon the mucosa. (See F. Lœffler, *Untersuchungen über die Bedeutung der Mikroorganismen für die Entstehung der Diphtherie.* Mittheilungen aus dem Kaiserlichen Gesundheitsamte 2d vol., Berlin, 1884.)

The incubation is of short duration, two to three days on an average, rarely more.

SYMPTOMS.

The symptoms and progress of the disease vary greatly according to circumstances. Sometimes it pursues its course in the mildest way, scarcely giving

rise to any symptoms of general disturbance, some-
times its course is almost fulminant.

We may distinguish three principal forms based
on the degree of gravity of the disease.

The first comprises the cases in which the diph-
theritic affection remains localized to the spots prima-
rily attacked and manifests no tendency to extension.
This form is in general the mildest, and may be called
benign local diphtheria.

In the second group we range the cases, in which
the diphtheritic products have a propensity to spread,
either in depth, giving rise to a thick eschar, or super-
ficially, propagating themselves by continuity of tissue
to the larynx and trachea below, and to the nasal mucous
membrane above. This tendency of the false mem-
branes to invade neighboring parts is always of evil
augury, but the infection none the less remains local-
ized, whatever may be the development which the
morbid process takes on. Hence the name of *grave
local diphtheria* may be given to this form.

We may make a third group of cases in which the
infectious agent penetrates the blood from the onset,
and produces in divers organs various lesions and
functional disturbances. Here it is with a real gen-
eral affection that we have to do, and the disease
merits the name of *malignant* or *infectious diphtheria.*

The distinction between these three forms is far
from being always clear. It is often the case that a
patient who was believed at the onset to be affected

with a benign form of diphtheria, all at once presents symptoms of malignity and succumbs to the disease, whether from extension of the false membranes or from penetration of the virus into the blood. It is, in fact, in these cases of diphtheria with invading tendency of the neo-membranous process, that we are especially apt to see the disease become general, the local becoming transformed into *septic diphtheria*.

The benign form, after having for some time been preceded by certain prodromes, such as lassitude, chills, headache, pains in the joints, ordinarily begins by a sensation of smarting and tickling in the throat, stiffness of the neck, swelling and sensibility to pressure of the glands near the angle of the lower jaw. These symptoms are accompanied by a fever which is generally moderate, rarely high. In some cases, the symptoms pertaining to the pharynx are so little pronounced as to pass unperceived.

Examination of the throat shows redness and swelling of one or both tonsils. The palatine arch, the velum pendulum, the uvula, and sometimes even the upper part of the pharynx participate in this swelling, which is generally less extensive than in common angina, but which is sufficiently troublesome to hinder speech and deglutition.

Little by little, sometimes at the end of several hours, oftener of one or two days, the pseudo-membranous exudation makes its appearance. It presents itself at first under the form of a whitish, punctiform,

or striated deposit. On the tonsils, these deposits
have their chosen seat upon the orifices of the fol-
licles, and in the milder cases may remain limited to
these points, but generally these little patches increase
in size, run together, and thus form by their union a
grayish-white or yellowish false membrane. Some-
times this membrane is but slightly adherent and is
easily detached; at others it is firmly fixed, removable
with difficulty, and underneath it the mucous mem-
brane is found excoriated and bleeding. But in every
case the membrane is re-formed almost immediately
after its removal.

While this exudation is going on, the fever per-
sists, though of a moderate type, and then by degrees
subsides. In mild cases, and in those that have a
favorable termination, the false membrane is soon
spontaneously detached, and is not again produced.
Below it the mucous membrane seems quite normal,
sometimes a little red and slightly ulcerated. The
patient may be completely restored at the end of from
six to ten days.

Grave local diphtheria has an onset precisely like
that of the mild form; the fever is, however, a little
higher, the exudation appears sooner, and early shows
a tendency to spread. This extension may be in depth
rather than superficially, and a large part of the tonsil
may mortify. The velum pendulum, the isthmus of
the fauces, and the neighboring organs may also be
affected with gangrene. In these cases there is al-

ways a considerable tumefaction of the glands of the neck and of the surrounding cellular tissue.

The sphacelated parts are not slow to undergo decomposition, and then all the untoward incidents present themselves, to which has been given the name *gangrenous angina,* •or *septic diphtheria.* A sanious liquid flows from the mouth, irritates and excoriates the surrounding skin, and gives to the breath of the patient a fetid odor.

By reason of the absorption into the blood of the products of the decomposition of the false membranes and of the necrosed tissues, symptoms of septicæmia set in, characterized by a profound prostration, a typhoid state, and, finally, by the signs of collapse and cardiac paralysis, the precursors of the fatal termination.

At other times, the gangrenous process limits itself, the slough separates, and the patient gets well with a more or less extensive loss of substance, which is little by little made up by cicatricial tissue.

In other cases, the process extends superficially rather than in depth. The false membranes after having invaded the whole of the throat, penetrate the larynx, and all the symptoms of true croup appear— hoarseness, to which succeeds complete aphonia, cough at first husky then weak and finally becoming extinct, dyspnœa, which is much more marked in children than in adults, etc. Inspiration is notably harsh, difficult, and sibilant, and the child makes the

most violent efforts to dilate the thorax. This state is often complicated with spasm or œdema of the glottis, which soon results in death by reason of the ever increasing obstacle interposed by the false membranes to the entrance of the air.

Sometimes the exudation invades the trachea and bronchi; the obstruction of these tubes soon results in extreme dyspnœa and finally in asphyxia.

At other times, the false membranes spread to the posterior nares, and invade the nasal cavities. The nares are obstructed, and there flows by the anterior orifices a sanious liquid which irritates and excoriates the skin and upper lip. This discharge often contains debris of false membrane mingled with a little blood; the salivary glands are sometimes a little tumefied. The process may also invade the middle ear by the Eustachian tube, and the conjunctiva by the nasal duct. Finally, as a result of accidental inoculations, often made unconsciously by the patients themselves while sunk in deep prostration, false membranes are sometimes seen to form on other mucous membranes, the vulva, for instance, or on parts of the skin deprived of their epidermis, such as blistered surfaces, leech bites, excoriations, accidental wounds, etc.

When the diphtheritic products spread at once over a large surface, and to a considerable depth, we have to do with a most malignant form which almost always causes death by septicæmia.

The larger the surface invaded by the diphtheri-

tic process, the more likely is the disease to become ·
general by the introduction of the infectious agent
into the blood. At the same. time, even in cases
where the false membranes have remained limited to
one or two small patches and have shown no tendency
to further development, observers have sometimes wit-.
nessed the sudden outbreak of all the symptoms of
general infection.*

The action of the poison on the divers organs
manifests itself by a variety of very grave disturb-
ances. On the part of the renal function we observe
albuminuria and hæmaturia; disorder of the cutaneous
function finds expression in erythematous eruptions,
urticaria, sanguineous extravasations, and petechiæ.
There are affections of the joints resembling acute
rheumatism. But the most frequent and formidable of
the determinations consequent on general blood
poisoning, are those which pertain to the heart, and

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* Guiraud remarks that the local manifestations may even
improve or disappear, while the general infection progresses.

Sanné relates a case in which the gravity of the general
symptoms formed a striking contrast with the slight develop-
ment of the local determinations. The child which was the
subject of this observation had only a small white patch on the
left tonsil; the respiration was perfectly free, the dysphagia
moderate; but he had at the same time symptoms indicating
that the poison had affected the heart, and died in collapse
from paralysis of that organ, twenty hours after the incep-
tion of the disease.—TR.

·which speedily give rise to symptoms of collapse and paralysis of the myocardium.

This termination is even noticed some times during the period of convalescence, when the false membranes have totally disappeared, and the patient seems to be almost well.

It is not always possible, however, to distinguish the exact cause of the septic accidents and the cardiac paralysis, and to tell if these are due to the action of the infectious agent itself, or to that of toxic substances resulting from the putrefaction and decomposition of sloughs.

As for the secondary affections of which we shall speak presently, these are to be referred, in general, to the direct action of the specific poison on the various tissues of the organism, notably the muscles and nervous system.

Complications and Sequelæ.

One of the most frequent complications of malignant diphtheria is the parenchymatous degenerations which invades various organs.

The spleen and the liver are sometimes augmented in size, and the hepatic cells generally betray a tendency to fatty degeneration. It is the same with the fibres of the myocardium, in which event the walls of the heart are thinned and its cavities dilated. These degenerations may be referred to the hyperthermia in cases where there has been a violent fever

and an elevated temperature; but they have also been found in cases where the fever has been of short duration and very moderate, and under such circumstances they can only be attributed to the direct action of the specific agent, or to that of the toxic products of putrefaction.

It is to these same causes that we must refer the albuminuria, so frequent in the course of the disease.

In many cases, this albuminuria is precisely like that which is observed in most febrile states, and hence is not of serious import. In other cases, however, especially when it is complicated with hæmaturia, or more rarely still with hæmoglobinuria and tube casts are found in the urine, this albuminuria is the expression of a nephritis provoked by the action of the morbid agent on the kidneys. In these cases the kidneys are found post mortem to be congested, tumefied, of deep red color, with little hæmorrhagic foci. The epithelial cells of the cortical substance show a cloudy tumefaction and granular degeneration. Colonies of microbes are found in the uriniferous tubules and in the blood vessels.

We have already spoken of the subcutaneous ecchymoses and sanguineous infiltrations. Sometimes also little blood extravasations take place in the internal organs. The separation of the sloughs in the throat and neighboring regions sometimes gives rise to a more or less abundant hæmorrhage. At the same time, it is rare to see in this disease the occurrence of

those multiple hæmorrhages which are the manifesta-
tion of a particular general state, the hæmorrhagic
diathesis.

In some cases, an endocarditis makes its appear-
ance, presenting all the characters of ulcerous endo-
carditis, and engendered probably by the diphtheritic
poison, or by some other infectant micro-organism.
As for the diseases which may supervene in the course
of diphtheria as accidental complications, they are
quite numerous and various.

Among the sequelæ of the disease, may be men-
tioned the profound marasmus and obstinate anæmia
into which convalescents sometimes fall, and which
are sometimes sufficiently grave to menace the ex-
istence of the patient. In some rare cases, there are
observed abscesses of the tonsils and extensive suppu-
rations of the glands of the neck and surrounding cel-
lular tissue.

The most frequent sequel is diphtheritic par-
alysis. This secondary affection generally manifests
itself at a time when all the symptoms of diphtheria
have disappeared and restoration seems complete; two
or three weeks, for instance, after the patient has
seemed to be out of danger. Although these par-
alyses which follow diphtheria were mentioned by the
older writers, the bond which connects them with the
preceding disease was not recognized till at a compara-
tively recent period.

The paralysis may affect widely different muscles

of the economy. The most common form is paralysis
of the velum-pendulum and the pharynx, which often
appears by itself, the other muscular systems being
exempt, and often also ushers in paralysis of other
parts of the organism. Its principal symptoms con-
sist in a very characteristic immobility and flaccidity
of the velum pendulum, which can no longer contract,
and fulfil its function as a diaphragm between the
nasal fossæ and the posterior pharynx. As a con-
sequence, the air escapes by the nose during the act
of speaking, giving the voice a strong nasal twang, and
the guttural sounds are indistinctly articulated. De-
glutition becomes difficult, and liquids escape in part
by the nasal fossæ. Alimentary particles find their
way into the larynx, giving rise to paroxysms of cough-
ing and crises of suffocation; in some cases they have
been known to penetrate the bronchi, engendering by
their presence as foreign bodies pulmonic inflamma-
tion and even gangrene. At other times the paralysis
gains the pharynx and œsophagus, rendering degluti-
tion impossible. The muscles of the larynx may also
be affected.

Next to paralysis of the velum pendulum, that of
the apparatus of visual accommodation is most fre-
quently observed. The patient, who continues to see
objects at a distance clearly, can no longer distinguish
those which are near at hand. The paralysis of the
muscles of the eye is more rare. The members, es-
pecially the lower extremities, are sometimes smitten,

and in these cases the paralysis is limited generally to a group of muscles, and is incomplete, so that the functions of the limbs are notably impeded, but are not abolished.

A general paralysis in which the respiratory muscles and diaphragm participate, and which entails death by asphyxia, is, on the contrary, very rare. The bladder, the rectum, and also the involuntary muscles are exceptionally attacked. Death may, however, be the consequence of paralysis of the heart. Disorders of the sensory nervous system are much less frequent and less marked. Various disturbances of the sensibility are sometimes noted, such as diminution of the tactile sense, numbness, formications, and other symptoms of incomplete or partial anæsthesia. Complete anæsthesia, limited to certain regions, has also been noticed, as well as hyperæsthesia, which is, however, rare. Lastly, disorders of the special senses have sometimes been observed, such as deafness, amblyopia, and even amaurosis.

The PROGNOSIS of diphtheritic paralysis is generally favorable. Recovery is the habitual termination, but this comes about slowly, and takes several months. It is only exceptionally that this complication menaces existence, as in cases where it affects the respiratory muscles or the heart muscle, or in those where the introduction of foreign bodies into the respiratory passages provokes asphyxia or pulmonic inflammation.

The PATHOGENY of diphtheritic paralysis is from any point of view very obscure. Authorities still dispute as to its origin; does it depend on an alteration of the muscles and peripheral nerves, is it, in a word, a paralysis of peripheral orgin, or is it caused by a lesion of the nervous centres? It is probable that both these etiological conditions are prevalent, and that they may even co-exist in the same patient.

The paralysis of the velum pendulum is generally due to an extension or reflection of the morbid process to the neighboring muscles, and is the result of degeneration of their fibres. In the other muscles, the paralysis may also have for its cause regressive alterations of the muscular tissue or peripheral nerves, as has been often proved by histological examination.

On the other hand, certain paralyses must be referred to central lesions, such as slight hemorrhages, or foci of degeneration, which are sometimes observed in the brain or spinal cord.

Electricity acts differently on the paralyzed muscles, according to the origin of the paralysis.

Diagnosis.

In well marked cases the diagnosis presents no difficulty. It is well to remember that the pain and other local symptoms may at the onset of the disease be completely wanting. It is important that the physician, when called to attend children, should ex-

amine the throat, even when there is no symptom which seems to direct the attention to this region; and he who neglects this precaution, is in danger of over-looking an invasion of diphtheria, and the disease may have already taken a wide extension before he is aware of it.

Apart from diphtheria, there exist other inflammations of the mouth and throat which give rise to the production of false membranes.

In phlegmonous angina, one sometimes finds croupous patches on the tonsils; in attacks of catarrhal angina, the orifices of the follicular glands are frequently covered with yellowish white concretions, constituted by the secretion of these glands and by numerous accidental micro-organisms. In mercurial stomatitis there is often a superficial mortification of the mucosa, which presents itself under the form of a whitish pseudo-membranous eschar.

We have already mentioned the secondary diphtheria which is so frequently observed in typhus and in all other grave infectious diseases. The form of stomatitis which has been designated under the name of *aphthous stomatitis*, and to which belong the contagious affections of the mouth and lips (aphthous fever) which are sometimes transmitted from the diseased cow to man by raw milk, may under certain circumstances give rise to diphtheritic processes. There exists, lastly, a contagious diphtheritic affection of the mouth which has prevailed epidemically at different times,

principally in the French army, and which is certainly specifically different from ordinary diphtheria of the throat.

If these divers diseases are generally easy to distinguish from true diphtheria, it is not so with scarlatinous angina and with true croup, whose differential diagnosis sometimes presents great difficulties.

In scarlatinous angina, the determination of other symptoms peculiar to that disease, the existence of an epidemic, etc., furnish valuable indications.

In the case of croup, the locality of the exudation, and its marked tendency to invade other regions, are of greater importance in diagnosis than the anatomical characters, which do not always respond to the definition adopted since Virchow's histological contributions.

As for all other diphtheritic processes, such as do not belong to the morbid conditions mentioned above—do they constitute one and the same disease, or have authorities (as has been said), confounded under the name of diphtheria many diseases specifically different.

This is a question which in the present state of our knowledge cannot be well answered, belonging, as it does, to the province of etiology; it in fact waits for its solution the day when medical investigators shall have succeeded in isolating the microbe of diphtheria, and in instituting pure cultures through many successive generations.

Prognosis

As might naturally be expected, the more the local lesions have extended, the graver is the prog-

nosis. The propagation of the false membranes to the larynx is almost sure to be followed by death, especially in children. The prognosis is still worse when the larynx and trachea are invaded. But even in cases where the pseudo-membrane is limited to the throat, the danger is still great, for the patient is not exempt from liability to septic infection, and the disease is quite as liable to become general, or blood-poisoning to ensue, from extension of the diphtheritic process in depth, as from its superficial extension.

Gangrenous angina, however limited may be the exudation, has always a malignant character, and the more pronounced the symytoms of septicæmia, the more serious is the prognosis. Patients have, however, been known to get well even after presenting all the signs of malignant diphtheria, such as subcutaneous hemorrhages, nephritis, etc.

From the point of view of prognosis, the state of the heart and pulse is of capital importance. As long as the action of the heart muscle is sufficiently strong and the pulse is not too rapid, one may have hope; but it will not do to lose sight of the fact that the situation may change from one moment to another, sometimes very rapidly and quite unexpectedly.

Even in forms apparently the most benign, the prognosis should be reserved, for the disease may at any moment extend and become general.

Children are more liable to the disease than adults, and the feeble more than the healthy. The

prognosis also depends, in a certain measure, on the character of the epidemic, which is sometimes grave, sometimes benign.

The mortality averages from 30 to 40 per cent., but it may vary within quite large limits.*

Treatment.

The prophylaxis of diphtheria must take etiology for its basis. Since the disease is eminently contagious, it behooves sanitary authorities to effect, as rigorously as possible, the isolation of all patients as soon as they are attacked. All objects, such as clothing, furniture, etc., which have been in contact with the patient, should be thoroughly disinfected, or if of little value, destroyed. The room which a patient has occupied should also be thoroughly disinfected· It is well, however, in times of epidemics to compel, as far as possible, all healthy persons to keep away from centres of infection. When diphtheritic products are accidentally projected (as by coughing) upon the face or other exposed parts of persons waiting on the patient (as often happens to physicians in swabbing out the throats of children), haste should be taken to wash

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* According to Guirand, formerly interne of the hospitals of Paris, the mortality from diphtheria in Paris from 1872 to 1876 was 76 per cent. and of late years it has been greater still. In Paris, Berlin, Vienna, Rome, Chicago, and Philadelphia, it is far the most fatal of all the infectious diseases.

the parts thus contaminated with a strong solution of phenic acid or salicylate of soda, and if there chance to be any wound or abrasion, to cauterize such lesions, as diphtheria has more than once been communicated in this manner.

The most efficacious means for disinfecting the clothing, bedclothes, etc., of the patient is to leave them a certain time in boiling water or subject them to a dry heat of 120° C. (248° F.)

For the disinfection of rooms, I recommend the following procedure. First wash with hot water the floor, the furniture and the walls, and while they are still wet, burn a couple of pounds of sulphur, the doors and windows being shut, and keep the room closed for twenty-four hours. The carpet should then be removed and the same cleansing and disinfection should be again gone through with. The floor may then be brushed over with spirits of turpentine, or if the flooring be of jointed plank, it should receive a thick coat of oil, all the joints having been calked with mastic.

Thus far no specific remedy for diphtheria has been found. Chlorate of potassium, benzoate of sodium, salicylate of sodium, calomel, cyanide of mercury, spirits of turpentine, and a host of other once vaunted substances, have all had their day, and have all failed to show any special curative virtues.

Chlorate of potash may be prescribed internally in the dose of six or seven grains every two hours to adults, and about half as much to children, so that in the one case the quantity of seventy-five grains, in the other, of thirty grains a day shall be administered.

This salt may also be used as a gargle and mouth wash. It will not do to forget that in large doses chlorate of potash sometimes gives rise to symptoms of poisoning, which may even have a fatal termination, symptoms which are more likely to be observed when the medicine is given on an empty stomach, absorption being then much more rapid.

The oil of turpentine may, in accordance with the recommendation of Bosse (1880), be employed in quite large doses, a tablespoonful suspended in milk for adults, a teaspoonful for children. If the specificity of this medicament in this terrible disease should be confirmed, the benefits derived from this treatment would more than compensate the disadvantages: the stomach disturbance, the pains in the loins (from renal congestion), and the strangury which it often occasions.

If we admit that diphtheria is always at the commencement a local affection, there is a very important primary indication to destroy the poison *in situ* by means of an effective local treatment, applied at the very onset, so as to abort the disease. For this end practitioners have tried all known caustics: hydrochloric acid, nitrate of silver, chloride of zinc, sulphate of copper, perchloride of iron; all the antiseptics: chlorine water, chlorate of potassium, potassium permanganate, hyposulphite of sodium, alcohol, boracic acid, creasote, carbolic acid, salicylic acid, quinoleine, thymol, iodoform. They have also had recourse to

substances which are supposed to soften and dissolve the false membranes, such as lime water, carbonates of lithia and potassa, lactic acid, papaine; astringents have also been employed, by means of which the attempt has been made to oppose the exudations: alum, tannin, nitrate of silver, etc.

Authorities have also advised, and attempts have been perseveringly made, to clear the throat of false membranes, both by frequent swabbing and by means of forcible jets of water directed upon the seat of the lesion. Lastly, recourse has been had to inhalations of steam in order to favor the reaction of the tissues, and the detachment of the diphtheritic products by suppuration.

The local treatment, however, has not given the results which *a priori* might have been expected from it, and all observers who have had much experience in this disease are unanimous on this point.

Energetic cauterizations have even often proved injurious. Besides the fact that in young children these caustic applications have frequently provoked spasms of the glottis and death by asphyxia, they produce a solution of continuity which is rapidly covered with false membranes, and thus a wider spread of the morbid process is promoted. Violent mechanical detachment of the diphtheritic exudations acts in the same way, and is the more dangerous since, by the excoriations which it causes, it may

facilitate the penetration of the infectious agent into
the blood.

The results so little fraught with encouragement
which have been obtained by the local treatment have
lead many physicians to abandon it altogether. It is
even to the negative results of topical medication that
those authorities appeal who persist in seeing in diph-
theria a disease which is primarily general. This de-
duction is, however, by no means warranted, for if we
admit, as a result of all past observations, that the in-
fectious agent finds a lodgment on the mucous mem-
brane before the false membranes have made their ap-
pearance, and that the moment when the latter are
formed the poison has already penetrated the interstices
of the mucous tissue to a greater or less depth, it is
easy to understand why disinfectants and caustics are
so inefficacious.

I do not believe that we can reach the infectious
agent by any local treatment, when once it has pene-
trated the interstices of the tissues and given rise to
the formation of exudations; but I do not on this ac-
count regard the local treatment as altogether ineffi-
cacious. Since 1870 I have given up cauterizations
and all violent topical medication. I now limit my-
self to local applications of sulphur in powder (*sulphur
sublimatum crudum*); with this I dust freely the dis-
eased mucous membrane by means of a large soft
camel's hair pencil. This operation is repeated every
hour, every two hours, or two or three times a day,

according to the indications. It is quite easy to apply this powder in the case of children, and if any of the sulphur enters the wind-pipe, the coughing which ensues is not violent; while any that passes into the stomach can do no harm.

This method, when early resorted to, seems to me to give better results than any which I have heretofore tried, and the course of the disease has certainly appeared to be milder in consequence. The false membranes are more easily detached, and seem to have less tendency to be reproduced and to spread.

It was in 1866 that sulphur was first recommended, and began to be used as a specific against diphtheria. At first it was administered suspended in water, being sometimes used as a gargle or with the swab, sometimes swallowed. Still later, the sulphur was employed in the form of powder, and was applied to the diseased surfaces by means of a powder blower. It must be confessed that the great majority of physicians who have tried this mode of treatment are agreed as to its inefficacy, and to-day the sulphur treatment is well nigh abandoned.

May not this unfavorable opinion be due in part to the fact that too much was expected of this remedy ?

In the grave forms, with considerable extension of the false membranes, and in the septic form especially, sulphur naturally will not succeed any better than other means. But in cases where it is employed from the very first, while the diphtheritic process is still quite limited, its favorable action is sufficiently manifest. Without being willing to pronounce it a specific remedy, I yet think it has a special action on the diphtheritic products. In any event, it is certain that sulphur has a useful mechanical action, and that it favors the de-

tachment of false membranes. I do not know whether there are other substances that produce the same effects, but sulphur is attended with no harm or inconvenience, and I see no reason for abandoning it.

Apart from these local applications of sulphur dusted or swabbed over the seat of the lesion, mild cases do not require any local treatment. In the grave cases, I order my older patients to gargle their throats with a strong solution of salicylate of soda, one part to ten, or one to four. In the case of younger patients, I resort to inhalations of the same solution, or a solution of phenic acid, and I have found these inhalations to be of benefit, whatever the age of the patient. I keep children continually in an atmosphere of antiseptic sprays generated by a steam atomizer which is going day and night.

Oertel causes his patients to inhale for five or ten minutes, every hour or two hours, a five per cent. solution of carbolic acid; the tube of the spray producer being directed toward the throat of the patients.

These inhalations ought to be followed up till the false membranes are about all detached, and till the swelling of the mucous membrane has subsided. They should be suspended if an olive-green coloration of the urine is produced.

When the process gains the nasal fossæ, injections with antiseptic solutions should be made.

In the use of inhalations, as well as of injections and gargles, it is a good plan to keep an exact account

of the quantity of the medicament which shall pene-
trate the stomach by deglutition, for without this pre-
caution, one will be very likely to see suddenly appear
grave symptoms of poisoning. The examination of
the urine is in the case of phenic acid a good means
of control. When the diphtheritic process has gained
the larynx, it is necessary to resort to medicaments
which have the property of dissolving false mem-
branes: inhalations of lime water, a 1 per cent. solu-
tion of carbonate of lithia, or lactic acid 1 part to
20. In some cases it is quite practicable to endeavor
to attack and remove the false membranes which form
in the larynx by means of a swab or camel's hair pen-
cil; at other times the result may be attained by means
of an emetic.

When symptoms of asphyxia appear, tracheotomy
or intubation of the larynx should be at once per-
formed. It will not do, however, to lose sight of the
fact that by reason of the danger of secondary infec-
tion of the wound, tracheotomy offers far fewer chances
of recovery in diphtheria than in croup.

It is quite proper also to attempt, as well in diph-
theritic angina as in laryngeal diphtheria, to moderate
the inflammation by an ice bladder kept constantly
applied to the neck, or by means of poultices.

On the other hand, leeches and blisters should
be absolutely proscribed as dangerous; in fact, every-
thing should be eschewed that gives rise to a wound
of the skin, by reason of the tendency of every sur-

face deprived of its epidermis to be covered with false membranes.

In all cases of diphtheria, it is very important to support the forces of the patient, and get him to take as much food as possible. It is a good plan to give decoction of cinchona, or quinine in small doses (two or three grains) several times a day, and especially wine and other alcoholic stimulants. The supporting treatment is especially indicated when signs of enfeeblement of the heart manifest themselves; and if this cardiac asthenia becomes more pronounced, there need be no fear of giving large doses of whiskey, conjoined it may be, with ether, camphor, ammonia, and other stimulants, and sometimes the subcutaneous method of administering certain stimulants, as alcohol and ether, may be advisable.

You will be guided in the treatment of the complications and sequelæ by the indications furnished by each case in particular. Diphtheritic paralysis demands only an expectant treatment. Electricity may in certain cases hasten the recovery, and will be especially of service in paralysis of the extremities, to prevent the atrophy and degeneration which are the consequence of inaction of the muscles. Ordinarily, induction currents suffice, but if these do not provoke marked muscular contractions, you can have recourse to constant currents. Warm baths, with or without salt, contribute also to hasten the return of functional activity.

In certain cases, the paralysis of the throat and mouth are so complete that it is necessary to have recourse to the œsophageal sound in order to feed the patient.

APPENDIX.

THE THERAPEUTICS OF DIPHTHERIA,*

BY DIFFERENT AUTHORITIES.

ALFRED STILLE.—*Local.*—Ice in mouth and on neck first stages. Alum or tannin by insufflation; muriatic acid by a brush; potassium chlorate; tincture iodine; lactic acid is a good solvent of the membrane; carbolic acid; potassium permanganate. *General* treatment is the indication, as the membrane will return till the cause is removed. Emetics may be advantageous in the early stage. "Supporting of nature is the only way to treat;" nature will eliminate the poison; in grave forms, stimulate; alcohol and stimulant doses of quinia: tincture of chloride of iron is absorbed, constringes the blood-vessels, and prevents exudation; food is the greatest of all indications; opium diminishes waste and nervousness; it also aids in the appropriation of other stimulants; alcohol can be borne in large doses; fluid beef, milk, farinaceæ; Huxham's tincture. In cases of medium intensity, give tonics rather than stimulants. Tracheotomy is fatal in about three-fourths of the cases. It is advisable under favorable circumstances.

J. SOLIS COHEN.—The two main indications consist: 1, in keeping up a supply of nourishment and stimulants, and 2, in providing for the detachment and discharge of the morbid accumulations when they threaten to occlude the air-passages. The sick-room must be systematically disinfected. This is done by the free use of sprays of carbolic or sulphuric acid. Solutions of the sulphate of iron or some other disinfectant are kept in all the vessels which are brought into the sick-room to

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receive discharges, the soiled clothing, refuse food and slops of the patient.

He regards the chlorine compounds as of more efficacy in diphtheria than all other remedies. Of these he prefers the tincture of the chloride of iron, which must be administered at frequent intervals and in large doses—from five to thirty drops, according to age and vigor of patient, should be given from every half hour to every second hour as the case may be. It is given in glycerine and water, or in diluted syrup of lemon. Dr. Cohen prescribes chlorate of potassium very frequently in this disease—in the form of *chlorine* mixture (made of an equal number of grains of the chlorate and of drops of hydrochloric acid, in plain or aromatic water, or in the infusion of quassia). He always suspends the use of this remedy when there are any symptoms of renal irritation produced by it.

He administers the hydrochlorate of quinia (in preference to the sulphate) as a tonic, antipyretic, neurotic, and antiseptic. It is to be given in decided doses. When deglutition is painful it is given by enema, with proper augmentation of the dose.

Alcohol, in the form of strong wine, or as brandy or rum, is regarded as of the utmost importance when the system begins to give way. It should be given after the earliest manifestations of decided loss of vigor. At this stage it is of more importance for the time being than any remedial agent. From f ℥ ss. to f ℥ j. of brandy are to be given at intervals of from fifteen minutes up to three hours. As long as it is well borne it may be given to any extent short of intoxication. Children readily take a sort of syrup of brandy made by burning it beneath a lump of sugar, which becomes melted in the process. At moments of sinking he regards carbonate of ammonium as valuable. He gives from two to ten grains by the mouth, in syrup of acacia, or from eight to forty grains by the rectum. At moments of collapse the ammonia is given by intravenous injection.

The sore throat is treated by pellets of ice placed in the mouth and renewed more or less cautiously. The use of ice-compresses is not approved. It is thought better to apply warm cotton batting, spongio-piline, or an actual cataplasm, or to anoint the neck with oil, lard, or cosmoline, care being taken not to abrade the cuticle lest local infection arise as a complication. Morphia is administered when great pain arises.

Morbid products in the pharynx and nasal passages undergoing detachment should be promptly removed. This morbid product is kept diffluent as much as possible by maintaining an excess of humidity in the atmosphere of the room by keeping a steaming vessel of water on the stove. The uninvaded tissue should never be cauterized. Applications of the tincture of the chloride of iron should be made to the pseudo-membrane with a swab of cotton or sponge. After this application the attempt may be made to remove the deposit by gargle, spray douche or syringe; employing lime-water at the medium. Forcible removal of the deposit is not regarded as judicious.

When the larynx is invaded Dr. Cohen keeps a constant stream of steam in motion directed over the patient's face. Whenever the respiration becomes obstructed, a few pieces of lime about the size of the fist are slacked by the bedside every hour or so, covering the vessel in which they are slacked with a hood of stiff paper, so as to direct the steam and particles of lime toward the mouth of the patient.

The use of emetics is indicated in children to provoke expectoration from the air-passages in the act of vomiting; but the same indication does not occur in adults who are able to expectorate voluntarily. If successful, the emetic may be repeated, at intervals of six hours, as long as the indications continue to recur. Alum, ipecac, and turpeth mineral are the most reliable agents, and may be tried in the order named; adhering to the alum if it prove efficient. Emesis should not be

carried too far, or be repeated if ineffectual, as it exhausts the power of the system without any compensation in the discharge of morbid products.

Should asphyxia be threatened from accumulations in the larynx or trachea, tracheotomy is indicated, and, though most frequently unsuccessful in averting death, it facilitates due access of atmospheric air to the lungs, and often saves lives that would otherwise be lost. The most careful attention is required after tracheotomy to keep the artificial passage clear. The stimulating treatment and the lime inhalations should not be discontinued. The two main indications for favorable prognosis after tracheotomy are desire for food and ability to expectorate. All treatment should be subservient to facilitating these great ends.

BARTHOLOW believes that there are two objects to be kept in view in the treatment of diphtheria:

1. To modify the course and shorten the disease; 2. To obviate the tendency to death.

First head.— The application of topical agents to the fauces and the adminisiration of internal remedies according to symptoms.

He entirely disapproves of caustic and acid applications as inviting the disease to the adjacent portions of the mucous membrane by destroying the epithelium. He does not think much of the value of benzoate of sodium. The application of sulphur in the form of powder, by insufflation or by blowing it over the whole diseased surface as far as it can be reached, he believes to be a good treatment. He regards lime-water and lactic acid as of value as solvents. Some pieces of freshly burned lime are put in water, and the patient directed to breathe the vapor as it rises, or a solution of lactic acid strong enough to taste distinctly sour is freely applied to the throat by a large mop. He places no value in the use of chlorate of potassium or tincture of the chloride of iron as faucial remedies.

When gangrenous sloughs are thrown off from the throat, carbolic acid is indicated, a one per cent. solution—not stronger than one per cent. This solution may be applied either by mop or syringe. When the exudation extends into the nares, the spray of a one per cent. solution of carbolic acid is generally thrown into them and kept up until the two canals are pervious, thus preventing the extension and decomposition of morbific materials and consequent swelling of the deep cervical glands and possible development of septicæmia. It is only when the exudation extends into the nares that much good can be accomplished by topical applications—so thinks Dr. Bartholow.

Second head.—The prevention of the diffusion of the morbific agent, of the development of septicæmia, and of failure of the heart.—With the earliest appearance of an exudation in the fauces, from two to ten grains of the bromide of ammonium are given every three hours. It is believed that the diffusion of this agent through the mucous membrane of the respiratory organs, and so out of the mouth, detaches the exudation. To prevent septic decomposition he advises the use of a drop or two of Lugol's solution in water every hour or two. This drug is to be given when the exudation is fully developed and spreading. He uses alcohol steadily, pushing it in large doses as an antiseptic agent. Quinia is also considered valuable in this same connection. Dr. Bartholow does not believe in the extraordinary powers of chlorate of potassium in this disease, as claimed by many. He fears its injurious effects on the kidneys.

As food, milk, egg-nog, and beef-tea are given freely about every three hours.

ABRAHAM JACOBI sums up the treatment as follows: Every case should be treated on general principles with symptomatics, roborants, stimulants, febrifuges, externally, internally, or hypodermically.

The uncertainty of the termination and the frequency of collapse, or sepsis, prohibit procrastination. Waiting long means often waiting too long. Alcohol is a very important adjuvant and remedy. The dose must often be apparently large, from two to twelve ounces daily, according to the circumstances.

Depletion is absolutely contra-indicated. Debilitating complications, such as diarrhœa, must be stopped instantly. Stomatitis, chronic pharyngitis, hypertrophy of the tonsils, glandular enlargements, must be relieved or removed preventively. Acute catarrh of the mouth and pharynx requires the use of potassium or sodium chlorate, in doses not exceeding a scruple daily for a child of a year, one to two drachms for an adult. The single doses must be small and very frequent— every hour, half, or quarter hour. Large doses are dangerous, result often in nephritis, and have proved fatal. The main indication in local diphtheria is local disinfection. To disinfect the blood effectively we have no means. Salicylic acid changes into a salicylate which is no longer a disinfectant. The amounts of disinfectants required to destroy bacteria are so great that the living body could not endure them. But the discipline of the house, school, and social intercourse can be so modified as to prevent the spreading of an epidemic. The inhalation of steam is very useful in catarrh of the respiratory organs, and also in inflammatory and diphtheritic affections. In fibrinous tracheo-bronchitis it has proved quite successful. But it may also prove dangerous by excluding oxygen and overheating the room or tent. Drinking large quantities of water, with or without stimulants, also excites action of the muciparous glands and aids in macerating membranes. The internal use of ice, and its local application to the affected parts, can be very useful. But the cases must be selected for each and any of the remedial agents and applications. The use of baths and the cold and hot pack is controlled by general

indications. The usefulness of lime-water and lactic acid has been greatly overestimated. Glycerin is a valuable adjuvant, both internally and externally, but nothing more. Turpentine inhalations are deserving of further trials, though they are more effective in purely inflammatory than in diphtheritic processes. Inhalations of chloride of ammonium act favorably in catarrhal and inflammatory conditions, and deserve a trial for the purpose of aiding maceration of membranes. Mercurials are contra-indicated in the septic and gangrenous forms of diphtheria, but in those which assume the purely inflammatory character, with less constitutional debility and collapse, as in sporadic croup or in fibrinous tracheo-bronchitis, some reliable clinicians claim good results. Astringents, such as alum, do not work favorably. Chloride of iron is among the most reliable antiseptic and astringent agents. Small doses at long intervals are quite useless. Moderate doses frequently repeated have a satisfactory general and local effect. A child of a year must take at least a drachm daily; a child of three or four years, from two to three drachms. The same or larger doses for an adult. The chloride is to be mixed with water and glycerine in various proportions, so that a dose is taken every hour, every half-hour, every ten minutes. Thus the local applications to the throat become almost superfluous. Potassium or sodium chlorate, half a drachm daily, may be added with advantage. Carbolic acid is useful both in local and internal administration. According to the end to be reached, it may be used either in concentrated form or in a one per cent. solution. Internally, in doses of a few grains to half a drachm daily. Salicylic acid acts as a caustic when concentrated; in moderate solutions it destroys fetor; salicylates are anti-febrile only. The anti-febrile effects of quinia are not so favorable in infectious as in inflammatory fevers; its antiseptic action is not satisfactory in practice. Deliquescent caustics are dangerous. Injury of the healthy mucous membrane must

be avoided. Mineral acids, and particularly carbolic acid, when their application can be limited to the desired locality are preferable. Bromine, both internally and externally, is warmly recommended by Wm. A. Thompson. Boric acid, in concentrated and milder solutions, has been recommended as a local application to membranous deposits generally, and to the diphtheritic conjunctiva in particular. Membranes must not be torn off, and not removed unless they are nearly detached. Caustics are contra-indicated, except where their application can be limited to the diseased surface. No healthy part must be torn. Swelled lymphatic glands require ice, iodine, iodoform, mercury, poultices, incision, carbolic acid, according to circumstances, and at all events frequent and careful disinfection of the mucous membrane from which their irritation originates. Diphtheria of the nose is apt to be fatal unless careful treatment is commenced at once. It consists of persistent disinfection of the nares and pharynx by injections. The tendency to sepsis forbids a long intermission of them. They must be continued day and night, for one to several days, no matter whether the glandular swelling is considerable or not. Laryngeal diphtheria proves fatal in almost every case, unless tracheotomy be performed. It is less successful the more the epidemic or case bears a septic character. Emetics are useful for the removal of half-detached membranes. Diphtheritic paralysis requires good and careful feeding—iron, strychnia, the faradic or galvanic currents, friction, hot bathing. Urgent cases indicate the hypodermic administration of strychnia. Diphtheritic conjunctivitis is benefited by ice and boracic acid; cutaneous diphtheria by local cauterization and disinfection, besides general treatment.

C. E. BILLINGTON recommends the following prescriptions:

No. 1.—Iron and Glycerine Mixture.

℞ Tinc. ferri chloridi, f ʒ j,
Glycerinæ,
Aquæ, ää f ℥ ij.

M. Sig.—A teaspoonful of this and of No. 2, alternately, every half hour through the day.

No. 2.—Chlorate of Potassium Mixture.

℞ Potassii chlorat, ʒ ss,
Glycerinæ, f ℥ ss,
Aquæ calcis, f ℥ ijss.

M. Sig.—A teaspoonful of this and of No. 1, alternately, every half-hour through the day.

No. 3.—Spray Mixture.

℞ Acid carbol, ℳ xv,
Aquæ calcis, f ℥ vj.

M. Sig.—To be used with a small hand atomizer.

The patient is allowed to sleep for an hour or two at a time at night. When awake, doses of Nos. 1 and 2 are alternated every half-hour. The throat is sprayed with No. 3 for several minutes at a time, whenever Nos. 1 and 2 are given. In spraying, the mouth is opened widely.

Where there is nasal implication the nose is thoroughly syringed out with warm or tepid salt-water, once, twice, or three times a day. This syringing is done with the patient's head inclined forward; a two-ounce hard-rubber ear syringe is used.

Dr. Billington never applies any brush or swab to the throat. He sometimes throws a drachm of No. 1, with a syringe, directly against the affected surface in the throat. He does not give quinia or any other unpleasant medicine to child-

ren. He does not give alcoholic stimulants except where a child, who cannot be induced to take other nourishment, will take weak milk-punch or egg-nog.

The patient is nourished with an abundance of cold milk, given frequently, to which a little lime-water is often advantageously added. When the stage of extreme exhaustion has been reached in bad cases the juice squeezed from beefsteak is given.

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